## Appendix E Traffic Analysis Worksheets

2018 Opening Year

Build River Center Site Alternatives 5-7

Interstate 526

		RAMP	S AND RAN	IP JUNCTI	ONS WC	RKS	HEET			
General Informatio	n			Site Infor						
Analyst	AJR		F	reeway/Dir of Tra	avel	I-526 E	В			
Agency or Company	Atkins			unction		3010-E	B Off to Pa	aulCantrell EB		
Date Performed	7/25/20		-	urisdiction						
Analysis Time Period	AM Pea	ak	A	nalysis Year		2018 B	uild - Rive	Center Site		
Project Description Navy B	ase ICTF									
Inputs	lc	rooway Num	ber of Lanes, N	2						
Upstream Adj Ramp	- 1	•							Downstrea	ım Adj
□Yes □On	- 1		r of Lanes, N	1					Ramp	
			ane Length, L <sub>A</sub>						□Yes	On
✓ No Off			ane Length L <sub>D</sub>	340					✓No	Off
	F	reeway Volu	me, V <sub>F</sub>	2645						
L <sub>up</sub> = ft	R	amp Volume	, V <sub>R</sub>	28					L <sub>down</sub> =	ft
\/ = \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \	F	reeway Free	-Flow Speed, $S_{FF}$	60.0					V <sub>D</sub> =	veh/h
V <sub>u</sub> = veh/h	R	amp Free-Fl	ow Speed, S <sub>FR</sub>	45.0					J*D	VC11/11
Conversion to pc/l	Unde	er Base (	Conditions							
(pc/h) (Veh	′	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	f <sub>p</sub>	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>
Freeway 264		0.90	Level	4	0	0.	980	1.00	29	98
Ramp 28		0.90	Level	36	0	0.	847	1.00	3	7
UpStream										
DownStream		erge Areas						\		
Estimation of v <sub>12</sub>		Estimat	ion o	f v	Diverge Areas					
					LStillat	1011 0				
	$_2 = V_F (F)$							· V <sub>R</sub> + (V <sub>F</sub> - V		
		on 13-6 or			L <sub>EQ</sub> =			Equation 13-1		
1 1111	using E	quation (E	Exhibit 13-6)		P <sub>FD</sub> =		1.	000 using Eq	uation (Exhi	bit 13-7)
12	pc/h				V <sub>12</sub> =		29	998 pc/h		
			-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>		0	pc/h (Equation	on 13-14 or	13-17)
Is $V_3$ or $V_{av34} > 2,700$ pc/h?					Is V <sub>3</sub> or V <sub>av</sub>	<sub>/34</sub> > 2,7	00 pc/h? [	☐Yes ☑ No		
Is $V_3$ or $V_{av34} > 1.5 * V_{12}/2$					Is V <sub>3</sub> or V <sub>av</sub>	<sub>/34</sub> > 1.5		☐Yes ☑No		
		quation 13	-16, 13-18, or		If Yes,V <sub>12a</sub> :	=		c/h (Equation	13-16, 13-	18, or 13
Capacity Checks	13-19)				Capacit			9)		
Aci	ual	C	apacity	LOS F?	Capacit	y Ciri	Actual	Ca	pacity	LOS F
Aci	uu:	Ĭ	apaony	2001:	V <sub>F</sub>		2998	Exhibit 13-		No
V	- 1,	Evhibit 12 0			$V_{FO} = V_{F}$			Exhibit 13-	_	_
V <sub>FO</sub>		Exhibit 13-8					2961			No
					V <sub>R</sub>		37	Exhibit 13-1		No
Flow Entering Mer				Violetian	Flow Er	_		rge Influen		\/iolotic=
Act		Exhibit 13-8	Desirable	Violation?	\/	$\neg$	Actual	Max Desiral Exhibit 13-8	4400:All	Violation
V <sub>R12</sub> Level of Service D			if not E)		V <sub>12</sub>		2998 vice De	terminatio		No No
					1					<u> </u>
$D_R = 5.475 + 0.00734$	v <sub>R</sub> + u.	0078 V <sub>12</sub> -	0.00627 L <sub>A</sub>					.0086 V <sub>12</sub> - 0.	.009 L <sub>D</sub>	
D <sub>R</sub> = (pc/mi/ln)					l .,	7.0 (pc	,			
OS = (Exhibit 13-2)							oit 13-2)			
Speed Determinati	on				Speed I					
$M_S = $ (Exibit 13-11)					1 1		xhibit 13			
$S_R = mph (Exhibit 13-$	11)				1	-	(Exhibit	-		
					$S_0$ = N/A mph (Exhibit 13-12)					
$S_0$ = mph (Exhibit 13-	11)				P <sub>0</sub> - N	/A IIIPII	(LXIIIDIL	10-12)		
$S_0$ = mph (Exhibit 13- S = mph (Exhibit 13-	,					-	(Exhibit	· ·		

	RAMP	S AND RAM	P JUNCTI	ONS WC	RKS	HEET			
General Information			Site Infor						
Analyst AJR		Fr	eeway/Dir of Tr	avel	I-526 E	:B			
Agency or Company Atkir	IS		ınction		3010-E	B Off to Pa	aulCantrell EB		
	/2014		ırisdiction						
Analysis Time Period PM F		Ar	nalysis Year		2018 B	uild - Rive	Center Site		
Project Description Navy Base IC	l F								
Inputs	Erooway Nun	nber of Lanes, N	2						
Upstream Adj Ramp	1 1							Downstrea	am Adj
☐Yes ☐On	Ramp Numbe	•	1					Ramp	
	1	Lane Length, L <sub>A</sub>						☐Yes	On
✓ No ☐ Off	1	Lane Length L <sub>D</sub>	340					☑ No	Off
	Freeway Volu	ıme, V <sub>F</sub>	2539						
L <sub>up</sub> = ft	Ramp Volume	e, V <sub>R</sub>	55					L <sub>down</sub> =	ft
V/ =	Freeway Free	e-Flow Speed, S <sub>FF</sub>	60.0					V <sub>D</sub> =	veh/h
$V_u = veh/h$	Ramp Free-F	low Speed, S <sub>FR</sub>	45.0					V D -	VCII/II
Conversion to pc/h Un	der Base	Conditions							
(pc/h) V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	f <sub>p</sub>	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>
Freeway 2539	0.90	Level	3	0	0.	985	1.00	28	63
Ramp 55	0.90	Level	15	0	0.	930	1.00	6	6
UpStream									
DownStream	Merge Areas								
Estimation of v <sub>12</sub>		Estimat	tion o	of v	Diverge Areas				
				LStillat	1011 0				
$V_{12} = V_{F}$							· V <sub>R</sub> + (V <sub>F</sub> - V		
	ation 13-6 or			L <sub>EQ</sub> =		(	Equation 13-	12 or 13-13	)
i iii	Equation (	Exhibit 13-6)		P <sub>FD</sub> =		1.	000 using Eq	uation (Exhi	bit 13-7)
$V_{12} = pc/h$				V <sub>12</sub> =		28	363 pc/h		
$V_3$ or $V_{av34}$ pc/h (	Equation 13	3-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>		0	pc/h (Equation	on 13-14 oı	13-17)
Is $V_3$ or $V_{av34} > 2,700$ pc/h? $V_{e}$	s 🗌 No			Is V <sub>3</sub> or V <sub>av</sub>	<sub>/34</sub> > 2,7	00 pc/h? [	☐Yes ☑ No		
Is $V_3$ or $V_{av34} > 1.5 * V_{12}/2$ $\square$ Ye	s 🗌 No			Is V <sub>3</sub> or V <sub>av</sub>	<sub>/34</sub> > 1.5	* V <sub>12</sub> /2	☐Yes ☑ No		
$f V_{PS} V = pc/h$	Equation 13	3-16, 13-18, or		If Yes,V <sub>12a</sub> :	=		c/h (Equation	13-16, 13	-18, or 13-
10 10	)			-			9)		
Capacity Checks	1 (	Panasih.	1.00.50	Capacit	y Cn		1 0	annoit.	1,00,5
Actual		Capacity I	LOS F?	V <sub>F</sub>		Actual	Exhibit 13-	apacity 8 4600	LOS F
						2863		_	No
V <sub>FO</sub>	Exhibit 13-8			$V_{FO} = V_{F}$		2797	Exhibit 13-		No
				V <sub>R</sub>		66	Exhibit 13-1		No
Flow Entering Merge In			1	Flow Er	_		rge Influen		1
Actual		Desirable	Violation?	.,	$\overline{}$	Actual	Max Desira		Violation'
V <sub>R12</sub>	Exhibit 13-8			V <sub>12</sub>		2863	Exhibit 13-8	4400:All	No No
Level of Service Deterr				1			terminatio		F)
$D_R = 5.475 + 0.00734 v_R +$	0.0078 V <sub>12</sub>	- 0.00627 L <sub>A</sub>		1			.0086 V <sub>12</sub> - 0	.009 L <sub>D</sub>	
$D_R = (pc/mi/ln)$				$D_R = 2$	5.8 (pc	/mi/ln)			
OS = (Exhibit 13-2)				LOS = C	(Exhi	oit 13-2)			
Speed Determination				Speed L	Deter	minatio	on		
M <sub>S</sub> = (Exibit 13-11)				$D_s = 0$	.304 (E	xhibit 13	-12)		
				S <sub>R</sub> = 54.5 mph (Exhibit 13-12)					
				O <sub>R</sub> - 5	4.5 mpi	(LXIIIDIL	10 12)		
$S_R$ = mph (Exhibit 13-11)				1		(Exhibit	*		
				$S_0 = N$	I/A mph	-	13-12)		

		RAMP	S AND RAN	IP JUNCTI	ONS WC	RKS	HEET			
General In	formation			Site Infor	mation					
Analyst	AJR		F	reeway/Dir of Tr	avel	I-526 E	В			
Agency or Comp	oany Atkir	ns	J	unction		3020-Е	B Off to Pa	aulCantrell WB		
Date Performed	7/25	/2014	J	urisdiction						
Analysis Time Po	eriod AM I	Peak	Д	nalysis Year		2018 B	uild - Rive	Center Site		
Project Descripti	ion Navy Base IC	TF								
Inputs										
Upstream A	Adj Ramp	1	ber of Lanes, N	2					Downstrea	am Adj
		Ramp Numbe	r of Lanes, N	1					Ramp	
☐Yes	□On	1	ane Length, L <sub>A</sub>						□Yes	On
✓ No	Off	1	ane Length L <sub>D</sub>	600					✓ No	Off
	a	Freeway Volu		2617						ft
L <sub>up</sub> =	ft	Ramp Volume	11	178					L <sub>down</sub> =	11
V,, =	veh/h	1	-Flow Speed, S <sub>FF</sub>	60.0					V <sub>D</sub> =	veh/h
<u> </u>			ow Speed, S <sub>FR</sub>	25.0						
Conversio	n to pc/h Un	der Base	Conditions	_				1		
(pc/h)	(Veh/hr)	PHF	Terrain	%Truck	%Rv		$f_{HV}$	f <sub>p</sub>	v = V/PHF	$x f_{HV} x f_{p}$
Freeway	2617	0.90	Level	10	0	0.	.952	1.00	30	)53
Ramp	178	0.90	Level	8	0	0.	.962	1.00	2	06
UpStream		$\bot$								
DownStream										
		Merge Areas			<b>5</b> (1)			Diverge Areas		
Estimation of v <sub>12</sub>					Estimat	ion c	of V <sub>12</sub>			
V <sub>12</sub> = V <sub>F</sub> ( P <sub>FM</sub> )						V <sub>12</sub> =	: V <sub>R</sub> + (V <sub>F</sub> - V	R)P <sub>FD</sub>		
- <sub>EQ</sub> =	(Equa	ation 13-6 or	13-7)		L <sub>EQ</sub> =		(	Equation 13-	12 or 13-13	)
P <sub>FM</sub> =	using	Equation (	Exhibit 13-6)		P <sub>FD</sub> =		1.	000 using Eq	uation (Exhi	bit 13-7)
/ <sub>12</sub> =	pc/h	, , ,	,		V <sub>12</sub> =			053 pc/h	(=	
/ <sub>3</sub> or V <sub>av34</sub>	•	(Equation 12	-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>			•	on 12 14 o	- 10 17)
			-14 01 13-17)			× 0 7			011 13-14 01	13-17)
	2,700 pc/h? ☐ Ye					•		☐ Yes ☑ No		
is $V_3$ or $V_{av34} >$	1.5 * V <sub>12</sub> /2 Ye		10 10 10		Is V <sub>3</sub> or V <sub>av</sub>	<sub>/34</sub> > 1.5		☐Yes ☑ No	10 10 10	
f Yes,V <sub>12a</sub> =	pc/h ( 13-19	(Equation 13	-16, 13-18, or		If Yes,V <sub>12a</sub> =	=		oc/h (Equatior 9)	13-16, 13	-18, or 13
Capacity C		)			Capacit	v Ch		9)		
supacity C	Actual		apacity	LOS F?	Joapacit	y 011	Actual		anacity	LOSE
	Actual		арасну	LOGTE	V <sub>F</sub>		3053	Exhibit 13-		
\/		E 12121 40 0							_	
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$		2847	Exhibit 13-	_	No
					V <sub>R</sub>		206	Exhibit 13-1	1900	No
Flow Enter	ring Merge II				Flow Er	nterin	g Dive	rge Influen		
	Actual		Desirable	Violation?		_	Actual	Max Desira	1	Violation
V <sub>R12</sub>		Exhibit 13-8			V <sub>12</sub>		3053	Exhibit 13-8	4400:All	No
Level of Se	ervice Deteri	mination (	if not F)		Level of	f Ser	vice De	terminatio	n (if not	F)
$D_R = 5.475$	+ 0.00734 v <sub>R</sub> +	0.0078 V <sub>12</sub> -	0.00627 L <sub>A</sub>			$D_R = 4$	1.252 + 0	.0086 V <sub>12</sub> - 0	.009 L <sub>D</sub>	
) <sub>R</sub> = (pc/m	ni/ln)				D <sub>R</sub> = 2	5.1 (pc	/mi/ln)			
.OS = (Exhi	ibit 13-2)				LOS = C	(Exhi	bit 13-2)			
Speed Det	ermination				Speed L			on		
<u>'</u>	oit 13-11)				<del></del>		xhibit 13			
-	Exhibit 13-11)				1	,	(Exhibit	*		
	•				1	-	(Exhibit	*		
	Exhibit 13-11)				'		•	•		
	Exhibit 13-13)						(Exhibit			
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		RAMP	S AND RAM	IP JUNCTI	ONS WC	)RKS	SHEET			
General In	formation			Site Infor						
Analyst	AJR		F	reeway/Dir of Tr	avel	I-526	EB			
Agency or Comp	oany Atkin	IS		unction		3020-	EB Off to Pa	aulCantrell WB		
Date Performed		/2014	•	urisdiction						
Analysis Time Po			A	nalysis Year		2018 I	Build - Rive	Center Site		
	ion Navy Base IC	l F								
Inputs		Eroowov Num	nber of Lanes, N	2					<u> </u>	
Upstream A	Adj Ramp	1 '							Downstrea	ım Adj
□Yes	□On	Ramp Numbe	•	1					Ramp	
□ 163		1	ane Length, L <sub>A</sub>						□Yes	On
✓ No	Off	Deceleration	Lane Length L <sub>D</sub>	600					✓ No	Off
		Freeway Volu	ıme, V <sub>F</sub>	2484						
L <sub>up</sub> =	ft	Ramp Volume	e, V <sub>R</sub>	587					L <sub>down</sub> =	ft
		Freeway Free	e-Flow Speed, S <sub>FF</sub>	60.0					V <sub>D</sub> =	veh/h
$V_u =$	veh/h	Ramp Free-F	low Speed, S <sub>FR</sub>	25.0					V <sub>D</sub> -	VEII/II
Conversio	n to pc/h Un	der Base	Conditions							
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	f <sub>p</sub>	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>
Freeway	2484	0.90	Level	9	0	0	).957	1.00	28	84
Ramp	587	0.90	Level	2	0	C	).990	1.00	65	59
UpStream										
DownStream										
<b>-</b>		Merge Areas			- ··			Diverge Areas		
Estimation	1 of V <sub>12</sub>				Estimat	tion				
	$V_{12} = V_{F}$	$(P_{FM})$					V <sub>12</sub> =	: V <sub>R</sub> + (V <sub>F</sub> - V	$_{R})P_{FD}$	
- <sub>EQ</sub> =	(Equa	ation 13-6 or	13-7)		L <sub>EQ</sub> =		(	Equation 13-	12 or 13-13	)
P <sub>FM</sub> =	using	Equation (	Exhibit 13-6)		P <sub>FD</sub> =		1.	000 using Eq	uation (Exhil	bit 13-7)
/ <sub>12</sub> =	pc/h				V <sub>12</sub> =		28	384 pc/h		
$V_3$ or $V_{av34}$	pc/h (	Equation 13	-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>		0	pc/h (Equation	on 13-14 or	13-17)
	2,700 pc/h? ☐ Ye	s 🗆 No				,34 > 2,	700 pc/h? [	☐Yes ☑ No		
	1.5 * V <sub>12</sub> /2 ☐ Ye							Yes ☑ No		
f Yes,V <sub>12a</sub> =			-16, 13-18, or		If Yes,V <sub>12a</sub>			c/h (Equation	13-16, 13-	18, or 13-
1 165, v <sub>12a</sub> –	13-19	)					1	9)		
Capacity C					Capacit	ty Ch	ı)			
	Actual		Capacity	LOS F?			Actual		apacity	LOS F
					V <sub>F</sub>		2884	Exhibit 13-	_	No
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$	- V <sub>R</sub>	2225	Exhibit 13-	8 4600	No
					$V_R$		659	Exhibit 13-1	0 1900	No
Flow Enter	ring Merge In	fluence A	\rea		Flow Er	nterii	ng Dive	rge Influen		
	Actual	Max	Desirable	Violation?		$\perp$	Actual	Max Desira	ble	Violation <sup>4</sup>
$V_{R12}$		Exhibit 13-8			V <sub>12</sub>		2884	Exhibit 13-8	4400:All	No
Level of Se	ervice Deterr	mination (	if not F)	-	Level o	f Ser	vice De	terminatio	n (if not l	F)
D <sub>R</sub> = 5.475 ·	+ 0.00734 v <sub>R</sub> +	0.0078 V <sub>12</sub>	- 0.00627 L <sub>A</sub>			D <sub>R</sub> =	4.252 + 0	.0086 V <sub>12</sub> - 0	.009 L <sub>D</sub>	
$D_R = (pc/m)$	ni/ln)				$D_R = 2$	3.7 (pd	c/mi/ln)			
* *	ibit 13-2)					Exh	ibit 13-2)			
`	ermination				Speed I			on		
	oit 13-11)				<del>  '</del>		Exhibit 13			
	Exhibit 13-11)				1	-	h (Exhibit			
	·				1		•	*		
	Exhibit 13-11)				$S_0$ = N/A mph (Exhibit 13-12) S = 48.9 mph (Exhibit 13-13)					
	Exhibit 13-13)						•			
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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	3025- P PaulC C	aulC WB Off to
Date Performed	7/25/2014		Jurisdiction	r daro c	<i>,</i>
Analysis Time Period	AM Peak		Analysis Year	2018 Βι Site	ıild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			es.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	2439	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 10	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length Up/Down %	Level mi	
L Calculate Flow Adjus	tmonte		Op/Down 70		
·				1.0	
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$		
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		$f_{LC}$		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performanc	e Measures	3	Design (N)		
			Design (N)		
Operational (LOS)	NI 6		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub> 1423	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	
x f <sub>p</sub> )			x f <sub>p</sub> )	114	pc/h/ln
S	60.0	mph	S		mph
$D = v_p / S$	23.7	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	С		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed			f = Evb:bit 44.0
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>p</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		se free-flow	f <sub>p</sub> - Page 11-18	11.0	TRD - Page 11-1
speed			LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	
DDHV - Directional design	hour volume		11-3		

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	3025- P PaulC C	aulC WB Off to
Date Performed	7/25/2014		Jurisdiction	r daro c	<i>7</i> 11
Analysis Time Period	PM Peak		Analysis Year	2018 Βι Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	☐ Plar	nning Data
Flow Inputs					
Volume, V AADT	1897	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 9	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length	Level mi	
DDIIV - AADI X IX X D		VEII/II	Up/Down %	1111	
Calculate Flow Adjus	tments				
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] 0.957	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performanc	e Measures	 S	Design (N)		
			Design (N)		
Operational (LOS)			Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub> 1101	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f	
x t <sub>p</sub> )		·	x f <sub>p</sub> )	П۷	pc/h/ln
S	60.0	mph	S P		mph
$D = v_p / S$	18.4	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	С		Required Number of Lanes	s, N	·
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed			f Evhihit 11.0
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>p</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18	11 2	TRD - Page 11-1
speed	hourveluse		LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-∠,	
DDHV - Directional design	nour volume		1		

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	RA	MPS AND	<b>RAMP JUNG</b>	CTIONS W	ORKSHI	EET				
General Infor				Site Infor						
Analyst	AJR		Fre	eeway/Dir of Tr		I-526 E	В			
gency or Company	Atkin	IS	Ju	nction		3030-E	B On from	Paul Cantrell		
ate Performed	7/25/	/2014	Ju	risdiction						
nalysis Time Perio			An	alysis Year		2018 B	uild - River	Center Site		
roject Description	Navy Base IC	TF								
nputs		1								
lpstream Adj Ramp		Freeway Num	ber of Lanes, N	2					Downstre	am Adj
7		Ramp Numbe	r of Lanes, N	1					Ramp	
Yes Or	1	Acceleration L	ane Length, L <sub>A</sub>	850					□Yes	On
☑ No ☐ Of	f	Deceleration L	ane Length L <sub>D</sub>							_
	1	Freeway Volu	me, V <sub>E</sub>	2439					✓ No	Off
<sub>ip</sub> = ft		Ramp Volume	'	1662					L <sub>down</sub> =	ft
			Flow Speed, S <sub>FF</sub>	60.0						
u = veh/h	1	1							$V_D =$	veh/h
	, , , ,		ow Speed, S <sub>FR</sub>	45.0						
onversion t	1 -	der Base (	Conditions							
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	$f_p$	v = V/PHF	$x f_{HV} x f_{p}$
reeway	2439	0.90	Level	10	0	0	952	1.00	1 2	2846
Ramp	1662	0.90	Level	19	0	_	913	1.00		2022
JpStream	1002	0.00	20101	10	<u> </u>	<del>  •</del>	310	1.00	<del>                                     </del>	.022
)ownStream										
		Merge Areas					D	iverge Areas		
Estimation of v <sub>12</sub>					Estimat	ion o	f v <sub>12</sub>			
	V <sub>12</sub> = V <sub>F</sub>	(P <sub>5M</sub> )					V <sub>40</sub> = \	/ <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>	)P_D	
=		ation 13-6 or	13-7)		=			Equation 13		3)
= _			ion (Exhibit 13-6)		L <sub>EQ</sub> =			-		
FM =			IOII (EXIIIDIL 13-0)		P <sub>FD</sub> =			sing Equation	JII (EXIIIDIL I	5-7)
12 =	2846	•			V <sub>12</sub> =			c/h	10.1110.1	<b>-</b> \
or V <sub>av34</sub>			13-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>			c/h (Equation		7)
s $V_3$ or $V_{av34} > 2,70$								]Yes ☐ No		
$s V_3 \text{ or } V_{av34} > 1.5$					Is V <sub>3</sub> or V <sub>av</sub>	<sub>34</sub> > 1.5		]Yes 🗌 No		
Yes,V <sub>12a</sub> =	pc/h 13-19)		3-16, 13-18, or		If Yes,V <sub>12a</sub> =	=		c/h (Equatio -19)	on 13-16, 1	3-18, or
Capacity Che		)			Capacit			-19)		
apaonty one	Actual		apacity	LOS F?	Capaon	) U.I.	Actual	Ca	pacity	LOS F?
	7 totaai	<del>l ĭ</del>	ариону	2001:	V <sub>F</sub>	$\neg$	7 totaai	Exhibit 13-		2001:
						\ <u>\</u>		_		+
$V_{FO}$	4868	Exhibit 13-8		Yes	$V_{FO} = V_{F}$	- v <sub>R</sub>		Exhibit 13-		
					V <sub>R</sub>			Exhibit 13	3-	
low Entering	a Merae In	ofluence A	rea	<u> </u>	Flow En	terin	a Diver	ge Influer	nce Area	
	Actual		Desirable	Violation?	1 1011 211		Actual	Max Des		Violation
TOW LITERITY			4600:All	Yes	V <sub>12</sub>	+	10100.	Exhibit 13-8	1	71010101
	-	Fxhihit 13-8			* 12		ioo Doi		(:5 (	<b>-</b> \
V <sub>R12</sub>	4868	Exhibit 13-8			Levelot	Son		arminatic	an iit nat	
V <sub>R12</sub> evel of Serv	4868 rice Deterr	nination (	if not F)		Level of					<u>F)</u>
V <sub>R12</sub> evel of Serv D <sub>R</sub> = 5.475 +	4868 Fice Determ 0.00734 v <sub>R</sub> + 0	nination (	if not F)			D <sub>R</sub> = 4	.252 + 0.	0086 V <sub>12</sub> - 0		<i>F)</i>
V <sub>R12</sub> evel of Serv D <sub>R</sub> = 5.475 + R = 37.2 (pc/m	4868 Fice Deterr 0.00734 v <sub>R</sub> + ( ni/ln)	nination (	if not F)		D <sub>R</sub> = (p	D <sub>R</sub> = 4 oc/mi/lr	.252 + 0. n)			<u>r)</u>
$V_{R12}$ Level of Serv $D_R = 5.475 + 6.47$	4868 ice Detern 0.00734 v <sub>R</sub> + ( ni/ln) 13-2)	nination (	if not F)		D <sub>R</sub> = (p LOS = (E	D <sub>R</sub> = 4 oc/mi/Ir Exhibit	.252 + 0. ı) 13-2)	0086 V <sub>12</sub> - 0		<i>F)</i>
$V_{R12}$ Level of Serv $D_R = 5.475 + 6.47$	4868 ice Detern 0.00734 v <sub>R</sub> + ( ni/ln) 13-2)	nination (	if not F)		D <sub>R</sub> = (p	D <sub>R</sub> = 4 oc/mi/Ir Exhibit	.252 + 0. ı) 13-2)	0086 V <sub>12</sub> - 0		<i>F)</i>
V <sub>R12</sub> Level of Serv  D <sub>R</sub> = 5.475 +  R = 37.2 (pc/n  OS = F (Exhibit  Speed Detern	4868 vice Determ 0.00734 v <sub>R</sub> + 0 ni/ln) 13-2) mination	nination (	if not F)		D <sub>R</sub> = (p LOS = (E <b>Speed L</b>	D <sub>R</sub> = 4 oc/mi/Ir Exhibit	.252 + 0. n) 13-2) <b>minatio</b>	0086 V <sub>12</sub> - 0		<i>F)</i>
$V_{R12}$ Level of Serv $D_R = 5.475 + 37.2 \text{ (pc/m}$ $DS = F \text{ (Exhibit)}$ Expeed Determine $S = 0.752 \text{ (Exhibit)}$	4868  ice Deterr  0.00734 v <sub>R</sub> + 0  ni/ln)  13-2)  mination  bit 13-11)	nination (	if not F)		D <sub>R</sub> = (p LOS = (E <b>Speed L</b> D <sub>s</sub> = (E	D <sub>R</sub> = 4 oc/mi/Ir Exhibit <b>Deter</b> Exhibit 1	.252 + 0. n) 13-2) <b>minatio</b>	0086 V <sub>12</sub> - 0		<u>r)</u>
V <sub>R12</sub> evel of Serv  D <sub>R</sub> = 5.475 +  R = 37.2 (pc/m  OS = F (Exhibit  Speed Deterr  S = 0.752 (Exi  R = 46.5 mph	4868 ice Detern 0.00734 v <sub>R</sub> + ( ini/ln) 13-2) mination bit 13-11) (Exhibit 13-11)	nination (	if not F)		$D_R = (p)$ $LOS = (E)$ $Speed L$ $D_S = (E)$ $S_R = m$	D <sub>R</sub> = 4 Dc/mi/lr Exhibit Detern Exhibit 1 ph (Exh	.252 + 0. 1) 13-2) <b>minatio</b> 3-12) ibit 13-12)	0086 V <sub>12</sub> - 0		<u></u>
V <sub>R12</sub> evel of Serv  D <sub>R</sub> = 5.475 +  R = 37.2 (pc/m  OS = F (Exhibit  Epeed Deterr  S = 0.752 (Exi R = 46.5 mph  D = N/A mph (	4868  ice Deterr  0.00734 v <sub>R</sub> + 0  ni/ln)  13-2)  mination  bit 13-11)	nination (	if not F)		$\begin{array}{ccc} D_{R} = & (p\\ LOS = & (E\\ \hline \textbf{Speed L}\\ D_{S} = & (E\\ S_{R} = & m\\ S_{0} = & m \end{array}$	D <sub>R</sub> = 4 pc/mi/lr Exhibit  Deterr Exhibit 1 ph (Exh ph (Exh	252 + 0. n) 13-2) <b>minatio</b> 3-12)	0086 V <sub>12</sub> - 0		<u>F)</u>

		MPS AND	RAMP JUNG			EI		
General Info	rmation			Site Infor	mation			
nalyst	AJR		Fr	eeway/Dir of Tr	avel I-	-526 EB		
gency or Compan	-			nction	3	030-EB On fron	n Paul Cantrell	
ate Performed		/2014		risdiction				
nalysis Time Perio			Ar	nalysis Year	2	018 Build - Rive	er Center Site	
roject Description	Navy Base IC	TF						
nputs		1						T
Jpstream Adj Ram	р	Freeway Num	ber of Lanes, N	2				Downstream Adj
		Ramp Number	r of Lanes, N	1				Ramp
□ Yes □ C	n	Acceleration L	ane Length, L <sub>Δ</sub>	850				□Yes □On
☑ No □ C	\tt	Deceleration L	ane Length L <sub>n</sub>					
✓ No □ C	/II	Freeway Volui		1897				☑ No ☐ Off
up = ft		Ramp Volume		1457				L <sub>down</sub> = ft
up		1	11					down
'u = veh/	'h	1	-Flow Speed, S <sub>FF</sub>	60.0				$V_D = veh/h$
u -		Ramp Free-Fl	ow Speed, S <sub>FR</sub>	45.0				
Conversion	to pc/h Une	der Base (	Conditions				-	
(pc/h)	V	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	f <sub>p</sub>	$V = V/PHF \times f_{HV} \times f_{D}$
. ,	(Veh/hr)							-
Freeway	1897	0.90	Level	9	0	0.957	1.00	2203
Ramp	1457	0.90	Level	18	0	0.917	1.00	1765
JpStream	+	++						
DownStream		Merge Areas					l Diverge Areas	
etimation c	of v	WEIGE ALEAS			Estimation	on of v	Diverge Aleas	
Estimation of v <sub>12</sub>					LStillati	<u>:=</u>		
	$V_{12} = V_{F}$	(P <sub>FM</sub> )					$V_R + (V_F - V_F)$	( 15
EQ =	(Equ	ıation 13-6 or	13-7)		L <sub>EQ</sub> =		(Equation 13	-12 or 13-13)
) <sub>FM</sub> =	1.000	using Equat	ion (Exhibit 13-6)		P <sub>FD</sub> =		using Equation	on (Exhibit 13-7)
12 =	2203	pc/h			V <sub>12</sub> =		pc/h	
or V <sub>av34</sub>		•	13-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>		pc/h (Equation	13-14 or 13-17)
s V <sub>3</sub> or V <sub>av34</sub> > 2,7			,			> 2.700 pc/h?	☐Yes ☐ No	
s V <sub>3</sub> or V <sub>av34</sub> > 1.5								
			3-16, 13-18, or				Yes No	on 13-16, 13-18, or
Yes,V <sub>12a</sub> =	13-19)		5-10, 15-10, 01		If Yes,V <sub>12a</sub> =		3-19   3-19	)   13-10, 13-16, 0
Capacity Ch					Capacity		/	
, ,	Actual	С	apacity	LOS F?		Actual	Ca	pacity LOS F?
					V <sub>F</sub>		Exhibit 13-	
.,		I			$V_{FO} = V_F$	V	Exhibit 13-	
$V_{FO}$	3968	Exhibit 13-8		No	V <sub>FO</sub> V <sub>F</sub>	V R	Exhibit 13	
		1 1			$V_R$		10	)-
			roa		Flow Ent	erina Dive	erge Influer	nce Area
low Enterin	a Merae In	ıfluence ∆						
low Enterin				Violation?	I TOW LITE	Actual		
	Actual	Max I	Desirable	Violation?		<del>,                                     </del>	Max Des	
V <sub>R12</sub>	Actual 3968	Max I Exhibit 13-8	Desirable 4600:All	Violation?	V <sub>12</sub>	Actual	Max Des Exhibit 13-8	sirable Violation
V <sub>R12</sub> .evel of Ser	Actual 3968 vice Deterr	Max I Exhibit 13-8 <b>mination</b> (i	Desirable 4600:All <b>if not F</b> )		V <sub>12</sub> Level of	Actual Service De	Max Des Exhibit 13-8 Etermination	sirable Violation' on (if not F)
V <sub>R12</sub> .evel of Ser D <sub>R</sub> = 5.475	Actual 3968  vice Determ + 0.00734 v <sub>R</sub> + 0	Max I Exhibit 13-8 <b>mination</b> (i	Desirable 4600:All <b>if not F</b> )		V <sub>12</sub> Level of	Actual  Service De  OR = 4.252 + 0	Max Des Exhibit 13-8	sirable Violation on (if not F)
V <sub>R12</sub> .evel of Ser  D <sub>R</sub> = 5.475  R = 30.3 (pc/	Actual 3968  vice Determ + 0.00734 v <sub>R</sub> + 0 mi/ln)	Max I Exhibit 13-8 <b>mination</b> (i	Desirable 4600:All <b>if not F</b> )		V <sub>12</sub> Level of D <sub>R</sub> = (pc	Actual  Service De  R = 4.252 + (c/mi/ln)	Max Des Exhibit 13-8 Etermination	sirable Violation on (if not F)
V <sub>R12</sub> .evel of Ser  D <sub>R</sub> = 5.475  R = 30.3 (pc/	Actual 3968  vice Determ + 0.00734 v <sub>R</sub> + 0 mi/ln)	Max I Exhibit 13-8 <b>mination</b> (i	Desirable 4600:All <b>if not F</b> )		V <sub>12</sub> Level of D <sub>R</sub> = (pc	Actual  Service De  OR = 4.252 + 0	Max Des Exhibit 13-8 Etermination	sirable Violation on (if not F)
V <sub>R12</sub> Level of Ser  D <sub>R</sub> = 5.475 D <sub>R</sub> = 30.3 (pc/	Actual 3968  vice Detern + 0.00734 v <sub>R</sub> + 0 mi/ln) it 13-2)	Max I Exhibit 13-8 <b>mination</b> (i	Desirable 4600:All <b>if not F</b> )		V <sub>12</sub> Level of  D <sub>R</sub> = (po	Actual  Service De  R = 4.252 + (c/mi/ln)	Max Des Exhibit 13-8 eterminatio 0.0086 V <sub>12</sub> - 0	sirable Violation' on (if not F)
V <sub>R12</sub> Level of Ser  D <sub>R</sub> = 5.475  D <sub>R</sub> = 30.3 (pc/ OS = D (Exhibitation of the content of the	Actual 3968  vice Determ + 0.00734 v R + (mi/ln) it 13-2)	Max I Exhibit 13-8 <b>mination</b> (i	Desirable 4600:All <b>if not F</b> )		V <sub>12</sub> Level of  D <sub>R</sub> = (po	Actual  Service De  OR = 4.252 + (  c/mi/ln)  xhibit 13-2)  eterminati	Max Des Exhibit 13-8 eterminatio 0.0086 V <sub>12</sub> - 0	sirable Violation on (if not F)
V <sub>R12</sub> Level of Ser  D <sub>R</sub> = 5.475  R = 30.3 (pc/ OS = D (Exhib)  Speed Deter U <sub>S</sub> = 0.451 (Exhip)	Actual 3968  vice Detern + 0.00734 v <sub>R</sub> + 0 mi/ln) it 13-2) mination  xibit 13-11)	Max I Exhibit 13-8 <b>mination (i</b> 0.0078 V <sub>12</sub> - 0.0	Desirable 4600:All <b>if not F</b> )	i———	V <sub>12</sub> Level of  D <sub>R</sub> = (po LOS = (Ex Speed Do D <sub>s</sub> = (Ex	Actual  Service De  O <sub>R</sub> = 4.252 + (  c/mi/ln)  shibit 13-2)  etermination  hibit 13-12)	Max Des Exhibit 13-8 etermination 0.0086 V <sub>12</sub> - 0	sirable Violation on (if not F)
V <sub>R12</sub> .evel of Ser  D <sub>R</sub> = 5.475  R = 30.3 (pc/ OS = D (Exhib)  Speed Deter  S <sub>S</sub> = 0.451 (Exist) R = 51.9 mph	Actual 3968  vice Determ + 0.00734 v <sub>R</sub> + 0 mi/ln) it 13-2) rmination xibit 13-11) n (Exhibit 13-11)	Max I Exhibit 13-8 <b>mination (i</b> 0.0078 V <sub>12</sub> - 0.0	Desirable 4600:All <b>if not F</b> )	i———	$V_{12}$ Level of $D_R = (pc)$ LOS = (Ex Speed Dos = (Ex S_R = mp	Actual  Service De  P <sub>R</sub> = 4.252 + (  C/mi/ln)  Actual  Service De  Reprise De  Actual  Actual	Max Des Exhibit 13-8 etermination 0.0086 V <sub>12</sub> - 0	sirable Violation' on (if not F)
V <sub>R12</sub> .evel of Ser  D <sub>R</sub> = 5.475  Q <sub>R</sub> = 30.3 (pc/ OS = D (Exhibited Speed Deter  I <sub>S</sub> = 0.451 (Exist	Actual 3968  vice Detern + 0.00734 v <sub>R</sub> + 0 mi/ln) it 13-2) mination  xibit 13-11)	Max I Exhibit 13-8 <b>mination (i</b> 0.0078 V <sub>12</sub> - 0.0	Desirable 4600:All <b>if not F</b> )	i———	$V_{12}$ Level of $D_R = (po)$ LOS = (Ex Speed Do $D_S = (Ex)$ $S_R = (Ex)$ $S_R = (Ex)$ $S_R = (Ex)$ $S_R = (Ex)$	Actual  Service De  O <sub>R</sub> = 4.252 + (  c/mi/ln)  shibit 13-2)  etermination  hibit 13-12)	Max Des Exhibit 13-8 Etermination 0.0086 V <sub>12</sub> - 0	sirable Violation' on (if not F)

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		3 Paul Cantrell to
Agency or Company	Atkins		From/To	Leeds	aui Cantieli to
Date Performed	7/25/2014		Jurisdiction	0040.5	"
Analysis Time Period	AM Peak		Analysis Year	Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	4101	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 10	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D		la /la	General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments				
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] 0.952	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performanc	e Measures	<del></del>	Design (N)		
			Design (N)		
Operational (LOS)			Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x I)$	N x f <sub>HV</sub> 2392	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f	
x t <sub>p</sub> )		•	x f <sub>p</sub> )	П۷	pc/h/ln
S	48.6	mph	S P		mph
D = v <sub>p</sub> / S	49.2	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	F		Required Number of Lanes	s, N	·
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed			f _ Evhihit 11 0
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>p</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18	11 2	TRD - Page 11-1
speed	hour volume		LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-∠,	
DDHV - Directional design	nour volume		1 0		

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	3040 - F Leeds	Paul Cantrell to
Date Performed	7/25/2014		Jurisdiction	Lecus	
Analysis Time Period	PM Peak		Analysis Year	2018 Βι Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			es.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	3354	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 9	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length	Level mi	
			Up/Down %		
Calculate Flow Adjus					
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] <i>0.957</i>	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		$f_{LC}$		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			'
LOS and Performanc	e Measures	6	Design (N)		
			Design (N)		
Operational (LOS)	NI £		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x x f_p)$	N X T <sub>HV</sub> 1947	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	$N \times f_{HV}$	pc/h/ln
s	57.8	mph	x f <sub>p</sub> )		
$D = v_p / S$	33.7	pc/mi/ln	S		mph
LOS	D		$D = v_p / S$ Required Number of Lanes	s N	pc/mi/ln
 Glossary			Factor Location		
N - Number of lanes	S - Spee	-d			
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>p</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18		TRD - Page 11-1
speed			LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	
DDHV - Directional design	hour volume		11-3		

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		RAMP	S AND RAN	IP JUNCTI	ONS WC	RKS	HEET			
General In	formation			Site Infor						
Analyst	AJR		F	reeway/Dir of Tr	avel	I-526 E	EB			
Agency or Comp	=			unction		3050-E	EB Off to Le	eeds		
Date Performed		/2014		urisdiction						
Analysis Time Po			ΑΑ	nalysis Year		2018 E	Build - Rive	Center Site		
Project Descripti <b>Inputs</b>	ion Navy Base IC	IF.								
•		Erooway Nur	nber of Lanes, N	2						
Upstream A	Adj Ramp	1 '							Downstrea	ım Adj
□Yes	□On	Ramp Numbe	•	1					Ramp	
		1	Lane Length, L <sub>A</sub>						□Yes	On
✓ No	Off	1	Lane Length L <sub>D</sub>	325					✓No	Off
	-	Freeway Volu		4101						ft
L <sub>up</sub> =	ft	Ramp Volume	13	667					L <sub>down</sub> =	п
V <sub></sub> =	veh/h	Freeway Free	e-Flow Speed, S <sub>FF</sub>	60.0					V <sub>D</sub> =	veh/h
<b>v</b> u	VCII/II	Ramp Free-F	low Speed, S <sub>FR</sub>	45.0					"	
Conversio	n to pc/h Un	der Base	Conditions							
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		$f_{HV}$	f <sub>p</sub>	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>
Freeway	4101	0.90	Level	10	0	0	.952	1.00	47	85
Ramp	667	0.90	Level	8	0	0	.962	1.00	77	<b>'</b> 1
UpStream										
DownStream		Manna Anana			-			)		
Merge Areas  Estimation of v <sub>12</sub>					Estimat	ion o	of v	Diverge Areas		
		(D )			Lotimat			\( \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		
	$V_{12} = V_{F}$							= V <sub>R</sub> + (V <sub>F</sub> - V		
-EQ =		ation 13-6 or			L <sub>EQ</sub> =			Equation 13-		
P <sub>FM</sub> =	_	Equation (	Exhibit 13-6)		P <sub>FD</sub> =			000 using Eq	uation (Exhi	bit 13-7)
V <sub>12</sub> =	pc/h				V <sub>12</sub> =			785 pc/h		
$V_3$ or $V_{av34}$			-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>			pc/h (Equation	on 13-14 or	13-17)
	2,700 pc/h? ☐ Ye					•		☐Yes ☑ No		
Is $V_3$ or $V_{av34}$ >	1.5 * V <sub>12</sub> /2				Is V <sub>3</sub> or V <sub>av</sub>	<sub>/34</sub> > 1.5		☐Yes ☑ No		
f Yes,V <sub>12a</sub> =	pc/h ( 13-19)		-16, 13-18, or		If Yes,V <sub>12a</sub> =	=		oc/h (Equatior 9)	1 13-16, 13-	18, or 13
Capacity C		)			Capacit	v Ch		<u> </u>		
- upuerey e	Actual		Capacity	LOS F?		<i>y</i>	Actual	Ca	apacity	LOS F
					V <sub>F</sub>		4785	Exhibit 13-		Yes
$V_{FO}$		Exhibit 13-8			V <sub>FO</sub> = V <sub>F</sub>		4014	Exhibit 13-	8 4600	No
FO					V <sub>R</sub>		771	Exhibit 13-1		No
Elow Entor	ring Merge In	ofluonoo /	l roo					rge Influen		110
TOW LINE	Actual		Desirable Desirable	Violation?	I IOW LI	_	Actual	Max Desira		Violation'
V <sub>R12</sub>		Exhibit 13-8			V <sub>12</sub>	$\neg$	4785	Exhibit 13-8	4400:All	Yes
	ervice Deterr		if not F)		<del></del>			terminatio	<u> </u>	
<b>Level of Service Determination (if not F)</b> D <sub>R</sub> = 5.475 + 0.00734 v <sub>R</sub> + 0.0078 V <sub>12</sub> - 0.00627 L <sub>A</sub>					1			.0086 V <sub>12</sub> - 0		)
D <sub>R</sub> = (pc/m		0.0070 112	0.00027 L <sub>A</sub>					.0000 112 0	.000 <u>L</u> D	
	ibit 13-2)				l ''		:/mi/ln)			
	· · · · · · · · · · · · · · · · · · ·					•	bit 13-2)	<u> </u>		
	ermination				Speed L					
•	oit 13-11)					-	xhibit 13			
	Exhibit 13-11)					-	n (Exhibit	*		
	Exhibit 13-11)				'	-	(Exhibit	-		
	Exhibit 13-13)				I		n (Exhibit			
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		RAMP	S AND RAM	P JUNCTI	ONS WO	RKS	HEET			
General Info	ormation			Site Infor						
Analyst	AJR		Fr	eeway/Dir of Tr	avel	I-526 E	В			
Agency or Compa	nny Atkir	าร	Ju	ınction		3050-E	B Off to Le	eeds		
Date Performed		/2014		ırisdiction						
Analysis Time Per		Peak	Aı	nalysis Year		2018 B	uild - Rive	r Center Site		
	n Navy Base IC	TF								
nputs		l								
Upstream Ad	lj Ramp	1	ber of Lanes, N	2					Downstrea	am Adj
		Ramp Numbe	•	1					Ramp	
□Yes	On	Acceleration L	ane Length, L <sub>A</sub>						Yes	On
✓ No	Off	Deceleration L	ane Length L <sub>D</sub>	325					☑ No	Off
		Freeway Volu	me, V <sub>F</sub>	3354					INO	
L <sub>up</sub> =	ft	Ramp Volume	, V <sub>D</sub>	315					L <sub>down</sub> =	ft
·		1	-Flow Speed, S <sub>FF</sub>	60.0						
$V_u =$	veh/h	1	ow Speed, S <sub>FR</sub>	45.0					V <sub>D</sub> =	veh/h
2	4		111	45.0						
conversion	to pc/h Un	der Base (	Sonaitions	1		_				
(pc/h)	(Veh/hr)	PHF	Terrain	%Truck	%Rv		$f_{HV}$	f <sub>p</sub>	v = V/PHF	$x f_{HV} x f_{p}$
Freeway	3354	0.90	Level	9	0	0.	957	1.00	38	94
Ramp	315	0.90	Level	15	0		930	1.00		76
UpStream										-
DownStream										
		Merge Areas						Diverge Areas		
Estimation	of v <sub>12</sub>				Estimat	ion o	f v <sub>12</sub>			
	V <sub>12</sub> = V <sub>F</sub>	( P <sub>EM</sub> )					V <sub>12</sub> =	V <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>	)P <sub>ED</sub>	
- <sub>EQ</sub> =		ation 13-6 or	13-7)		L <sub>EQ</sub> =			Equation 13-1		)
		Equation (E			P <sub>FD</sub> =			.000 using Equ		
P <sub>FM</sub> = / =	_	Lquation (L	EXTIIDIT 10 0)		V <sub>12</sub> =				iation (Exili	DIL 13-1)
/ <sub>12</sub> =	pc/h	/F 1! 40	44 - 40 47)					894 pc/h	40.44	40.47)
/ <sub>3</sub> or V <sub>av34</sub>		(Equation 13	-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>	. 0.7		pc/h (Equatio	on 13-14 or	13-17)
	,700 pc/h? ☐ Ye					• .		☐ Yes ☑ No		
	.5 * V <sub>12</sub> /2 Ye		10 10 10		Is V <sub>3</sub> or V <sub>av</sub>	<sub>34</sub> > 1.5		☐Yes ☑ No	40.40.40	
f Yes,V <sub>12a</sub> =	pc/h ( 13-19		-16, 13-18, or		If Yes,V <sub>12a</sub> =	=		oc/h (Equation 9)	13-16, 13-	-18, or 13
Capacity Ci		)			Capacit	v Ch		9)		
supacity Ci	Actual		apacity	LOS F?	Capacit	<i>y 011</i>	Actual	Ca	pacity	LOS F
	7101001	<del>l ĭ</del>	араску	LOOT:	V <sub>F</sub>		3894	Exhibit 13-8		No
\/		E 1/1/40 0				\/			_	_
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$	- v <sub>R</sub>	3518	Exhibit 13-8		No
					V <sub>R</sub>		376	Exhibit 13-1		No
low Enteri	ing Merge Ir				Flow En	terin	g Dive	rge Influen		
	Actual	Max	Desirable	Violation?		/	Actual	Max Desirat	le	Violation
V <sub>R12</sub>		Exhibit 13-8			V <sub>12</sub>	3	3894	Exhibit 13-8	4400:All	No
evel of Se	rvice Deteri	mination (i	f not F)		Level of	F Serv	ice De	terminatio	n (if not	F)
$D_R = 5.475 +$	0.00734 v <sub>R</sub> +	0.0078 V <sub>12</sub> -	0.00627 L <sub>A</sub>			$D_R = 4$	.252 + 0	.0086 V <sub>12</sub> - 0.	009 L <sub>D</sub>	
) <sub>R</sub> = (pc/mi		12	7.				/mi/ln)	12	5	
	oit 13-2)				l ''		oit 13-2)			
Speed Dete	<u> </u>				Speed L	<u> </u>		<u> </u>		
ppeed Dete										
l <sub>S</sub> = (Exibit 13-11)					1 '	-	xhibit 13			
					$S_R$ = 54.0 mph (Exhibit 13-12)					
•	xhibit 13-11)				1		(	,		
$S_R = mph (E$	Exhibit 13-11) Exhibit 13-11)						(Exhibit	•		
$s_R^{=}$ mph (E $s_0^{=}$ mph (E					$S_0 = N$	/A mph	•	13-12)		

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	3055 - L On	eeds Off to Leeds
Date Performed	7/25/2014		Jurisdiction	On	
Analysis Time Period	AM Peak		Analysis Year	2018 Bu Site	ıild - River Center
Project Description Navy	Base ICTF				
☑ Oper.(LOS)			Des.(N)	☐ Plar	nning Data
Flow Inputs					
Volume, V AADT	3434	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 10	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length Up/Down %	Level mi	
Calculate Flow Adjus	tmonts		Ор/D0WI1 70		
	1.00		E <sub>R</sub>	1.2	
f <sub>p</sub>					
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$		
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance	_	ft	$f_{LW}$		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performanc	e Measures	3	Design (N)		
			Design (N)		
Operational (LOS)	NI f		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x I)$	N X T <sub>HV</sub> 2003	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	
x f <sub>p</sub> )	<b>57</b> 4	and the	$x f_p$		pc/h/ln
S D = · · · / C	57.1	mph	s		mph
$D = v_p / S$	35.1	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	E		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed			f Evhibit 14.0
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>p</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18	11.0	TRD - Page 11-1
speed	la		LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-∠,	
DDHV - Directional design	nour volume		1-7		

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>I-526 EE</i>	3
Agency or Company	Atkins		From/To		eeds Off to Leeds.
Date Performed	7/25/2014		Jurisdiction	On	
Analysis Time Period	PM Peak		Analysis Year	2018 Bu Site	ıild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			es.(N)	☐ Plar	nning Data
Flow Inputs					
Volume, V AADT	3039	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 9	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub> General Terrain:	0 Level	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments		·		
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] 0.957	
Speed Inputs			Calc Speed Adj and I	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph		00.0	Прп
LOS and Performanc	e Measures		Design (N)		
Operational (LOS)	NI v. f		Design (N) Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x x f_p)$	1764	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	$N \times f_{HV}$	pc/h/ln
S	59.5	mph	x f <sub>p</sub> )		•
$D = v_p / S$	29.6	pc/mi/ln	S		mph
LOS	D		$D = v_p / S$ Required Number of Lanes	e NI	pc/mi/ln
Glossary			Factor Location	, 14	
N - Number of lanes	S - Spee	ad.			
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>p</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		se free-flow	f <sub>p</sub> - Page 11-18		TRD - Page 11-11
speed	25 50		LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	
DDHV - Directional design	hour volume		11-3		

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			REEWAY	/ WEAV			Т				
General	Information	on			Site Information						
Analyst Agency/Con Date Perforr Analysis Tim	ned	AJR Atkins 7/25/20 AM Pea			Weaving Seg	Freeway/Dir of Travel I-526 EB Weaving Segment Location 3060 - Leeds to Dorchester Analysis Year 2018 Build - River Center Site					
Inputs	STIPRIOTI TVAVY DE	300 1011									
Weaving configuration Weaving number of lanes, N Weaving segment length, L <sub>s</sub> Freeway free-flow speed, FFS  Conversions to pc/h Under Base C				2020ft 60 mph	Segment typ Freeway min Freeway max Terrain type	imum speed,			Freeway 19 2300 Leve		
Convers	1	1	T T	T .	W						
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	$f_{HV}$	fp	v (pc/h)		
$V_{FF}$	3132	0.90	9	0	1.5	1.2	0.957	1.00	3637		
$V_{RF}$	224	0.90	9	0	1.5	1.2	0.957	1.00	260		
$V_{FR}$	302	0.90	12	0	1.5	1.2	0.943	1.00	356		
$V_RR$	22	0.90	12	0	1.5	1.2	0.943	1.00	26		
$V_{NW}$	3663				-	_		V =	4279		
$V_{W}$	616										
VR	0.144										
Configu	ration Cha	aracteris	tics		,						
Minimum m	aneuver lanes, N	$N_{WL}$		2 lc	Minimum we	eaving lane cl	nanges, LC <sub>MIN</sub>		616 lc/h		
Interchange	density, ID			1.0 int/mi	Weaving lan	ie changes, L	.C <sub>w</sub>		869 lc/h		
Minimum RI	F lane changes,	$LC_{RF}$		1 lc/pc	Non-weaving	g lane chang	es, LC <sub>NW</sub>		1272 lc/h		
Minimum FF	R lane changes,	$LC_FR$		1 lc/pc	Total lane ch	nanges, LC <sub>ALI</sub>	L		2141 lc/h		
Minimum RI	R lane changes,	$LC_{RR}$		lc/pc	Non-weaving	g vehicle inde	ex, I <sub>NW</sub>		740		
Weaving	g Segment	Speed,	Density, l	Level of	Service,	and Cap	acity				
Weaving se	gment flow rate,	, V		4279 pc/h		ensity factor,			0.237		
Weaving se	gment capacity,	$C_{W}$		6175 veh/h	, ,	gment speed			49.1 mph		
Weaving se	gment v/c ratio			0.663	*	aving speed,	**		51.4 mph		
	gment density, [	)	29	9.1 pc/mi/ln	Average non				48.7 mph		
Level of Ser	vice, LOS			D	Maximum we	eaving length	ı, L <sub>MAX</sub>		3971 ft		
Notes											
Chapter 13, "	egments longer the Freeway Merge a ses that exceed the	and Diverge Se	gments".	· ·		solated merge	and diverge ar	eas using the	procedures of		

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			REEWAY	WEAV			T			
General	Information	on			Site Information					
Analyst Agency/Con Date Perforr Analysis Tin Project Desc	med	AJR Atkins 7/25/20 PM Pea			Freeway/Dir of Travel Weaving Segment Location Analysis Year  I-526 EB 3060 - Leeds to Dorchester 2018 Build - River Center Site					
Inputs	, ,									
Weaving seg	mber of lanes, N gment length, L <sub>s</sub> e-flow speed, FF	S FS		One-Sided 3 2020ft 60 mph	Segment typ Freeway min Freeway max Terrain type	imum speed			Freewa 1 230 Leve	
Convers	sions to po	ı	1	i'	î .	1			1	
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	ER	$f_{HV}$	fp	v (pc/h)	
$V_{FF}$	2679	0.90	7	0	1.5	1.2	0.966	1.00	3081	
$V_{RF}$	784	0.90	7	0	1.5	1.2	0.966	1.00	902	
$V_{FR}$	360	0.90	7	0	1.5	1.2	0.966	1.00	414	
$V_{RR}$	106	0.90	7	0	1.5	1.2	0.966	1.00	122	
$V_{NW}$	3203							V =	4519	
$V_{W}$	1316									
VR	0.291									
Configu	ration Cha	aracteris	tics							
Minimum m	aneuver lanes, N	N <sub>WL</sub>		2 lc	Minimum we	eaving lane c	hanges, ${\sf LC}_{\sf MIN}$		1316 lc/h	
Interchange	density, ID			1.0 int/mi	Weaving lan	e changes, L	_C <sub>w</sub>		1569 lc/h	
Minimum R	F lane changes,	$LC_{RF}$		1 lc/pc	Non-weaving	g lane chang	es, LC <sub>NW</sub>		1177 lc/h	
Minimum FF	R lane changes,	$LC_FR$		1 lc/pc	Total lane ch	nanges, LC <sub>AL</sub>	L		2746 lc/h	
Minimum RI	R lane changes,	$LC_{RR}$		lc/pc	Non-weaving	g vehicle inde	ex, I <sub>NW</sub>		647	
Weaving	g Segment	Speed,	Density, I	_evel of	Service,	and Cap	pacity			
Weaving se	gment flow rate,	V		4519 pc/h	Weaving inte				0.288	
Weaving se	gment capacity,	$c_{w}$		5899 veh/h	Weaving seg				45.0 mph	
	gment v/c ratio			0.740	Average wea		**		49.9 mph	
_	gment density, [	)	33	3.4 pc/mi/ln	Average non				43.3 mph	
Level of Ser	rvice, LOS			D	Maximum we	eaving length	n, L <sub>MAX</sub>		5490 f	
Notes										
Chapter 13, "	egments longer the Freeway Merge a Frest that exceed the	ınd Diverge Se	gments".			solated merge	and diverge are	eas using the	procedures of	

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	T	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>I-526 El</i>	 B
Agency or Company	Atkins		From/To	3065-D	orches Off to
Date Performed	7/25/2014		Jurisdiction	Dorches	s On
Analysis Time Period	AM Peak		Analysis Year	2018 Bu Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	3356	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 9	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments				
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] <i>0.957</i>	
Speed Inputs			Calc Speed Adj and		
Lane Width		ft	<u> </u>		
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	1	60.0	·
Base free-flow Speed,		•	FFS	60.0	mph
BFFS		mph			
LOS and Performanc	e Measures	<u> </u>	Design (N)		
Operational (LOS)			Design (N)		
$v_p = (V \text{ or DDHV}) / (PHF x)$	Nyf		Design LOS		
v f )	11 A 1HV 1948	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	$N \times f_{HV}$	pc/h/ln
x f <sub>p</sub> )	57.8	mph	x f <sub>p</sub> )		релин
$D = v_p / S$	33.7	•	S		mph
LOS	55.7 D	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LO3	D		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed	E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens		1 '		_,,
v <sub>n</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		se free-flow	f <sub>p</sub> - Page 11-18	11.0	TRD - Page 11-11
speed			LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-2,	
DDHV - Directional design	hour volume		111-0		

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	T	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>I-526 El</i>	 3
Agency or Company	Atkins		From/To	3065-D	orches Off to
Date Performed	7/25/2014		Jurisdiction	Dorches	s On
Analysis Time Period	PM Peak		Analysis Year	2018 Βι Site	ıild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	3463	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 8	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments				
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] <i>0.962</i>	
Speed Inputs			Calc Speed Adj and		
Lane Width		ft	,		
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	1	60.0	
Base free-flow Speed,		·	FFS	60.0	mph
BFFS		mph			
LOS and Performanc	e Measures	<b>3</b>	Design (N)		
Operational (LOS)			Design (N)		
$v_p = (V \text{ or DDHV}) / (PHF x)$	Nyf		Design LOS		
v <sub>p</sub> = (v or bbriv)/(i i ii x i	11 A 1HV 2001	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	$N \times f_{HV}$	pc/h/ln
x f <sub>p</sub> )	57.1	mph	x f <sub>p</sub> )		ролли
$D = v_p / S$	35.1	pc/mi/ln	S		mph
LOS	55.1 E	рс/пп/п	$D = v_p / S$		pc/mi/ln
L03	L		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed	E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens		$E_{\rm R}$ - Exhibits 11-10, 11-12 $E_{\rm T}$ - Exhibits 11-10, 11-11,		f <sub>LC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate	FFS - Free	e-flow speed	<b>!</b> '	11-10	20
LOS - Level of service		se free-flow	f <sub>p</sub> - Page 11-18	11.0	TRD - Page 11-11
speed			LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-∠,	
DDHV - Directional design	nour volume		111-0		

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General	Information				1					
	IIIIOIIIIau	on			Site Info	rmation				
Analyst Agency/Com Date Perform Analysis Tim	ned	AJR Atkins 7/25/20 AM Pe			Freeway/Dir of Travel Weaving Segment Location Analysis Year  I-526 EB 3070 - Dorchester to Montague 2018 Build - River Center Site					
Project Desc I <b>nputs</b>	cription Navy Ba	ase ICTF								
Weaving configuration One Weaving number of lanes, N Weaving segment length, L <sub>S</sub>				One-Sided 3 1515ft 60 mph	Segment typ Freeway min Freeway max Terrain type	imum speed			Freewa 1 230 Leve	
Convers	1	1	1	ı	1		1 .		T	
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	f <sub>HV</sub>	fp	v (pc/h)	
/ <sub>FF</sub>	2735	0.90	9	0	1.5	1.2	0.957	1.00	3176	
/ <sub>RF</sub>	548	0.90	19	0	1.5	1.2	0.913	1.00	667	
/ <sub>FR</sub>	621	0.90	10	0	1.5	1.2	0.952	1.00	725	
/ <sub>RR</sub>	124	0.90	19	0	1.5	1.2	0.913	1.00	151	
/ <sub>NW</sub>	3327							V =	4719	
$I_{W}$	1392									
/R	0.295									
	ration Cha		tics		I					
	aneuver lanes, I	$N_{WL}$		2 lc		_	hanges, LC <sub>MIN</sub>		1392 lc/h	
Interchange	•			0.8 int/mi	Weaving lan	_	**		1588 lc/h	
	lane changes,	1.0		1 lc/pc	Non-weaving	_			929 lc/h	
	R lane changes,	110		1 lc/pc	Total lane ch	- AL	_		2517 lc/h	
	R lane changes,	TAIX			Non-weaving				403	
<u>Neaving</u>	g Segment	Speed,	Density, l	Level of	1					
0 (	gment flow rate,			4719 pc/h	Weaving into	•			0.337 44.1 mph	
	gment capacity,	C <sub>W</sub>		5722 veh/h	Average wea				44.1 mpi 48.6 mph	
•	gment v/c ratio	n	21	0.789	Average non		**		42.4 mpf	
vveaving seq Level of Ser	gment density, [ vice_LOS	J	3:	5.7 pc/mi/ln E	Maximum we		****		42.4 mpi 5530 f	
	, 200				IVIAXIIIIUIII W		ı, ∟ <sub>MAX</sub>			
Chapter 13, "F	egments longer the Freeway Merge a es that exceed the	and Diverge Se	egments".	· ·		solated merge	and diverge are	eas using the	procedures of	

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			REEWAY	/ WEAV			Т			
Genera	Information	on			Site Information					
Analyst Agency/Cor Date Perfor Analysis Tin Project Des	med	AJR Atkins 7/25/20 PM Pea ase ICTF			Weaving Seg	Freeway/Dir of Travel I-526 EB Weaving Segment Location 3070 - Dorchester to Montagor Analysis Year 2018 Build - River Center Site				
Inputs										
Weaving configuration Weaving number of lanes, N Weaving segment length, L <sub>s</sub> Freeway free-flow speed, FFS  Conversions to pc/h Under Base C			One-Sided 3 1515ft 60 mph	Terrain type				Freewa 1 230 Leve		
Conver	1	ı	li .	l)	11	1				
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	$f_{HV}$	fp	v (pc/h)	
$V_{FF}$	2667	0.90	8	0	1.5	1.2	0.962	1.00	3082	
$V_{RF}$	780	0.90	11	0	1.5	1.2	0.948	1.00	914	
$V_{FR}$	796	0.90	8	0	1.5	1.2	0.962	1.00	920	
$V_{RR}$	233	0.90	11	0	1.5	1.2	0.948	1.00	273	
V <sub>NW</sub>	3355							V =	5189	
$V_{W}$	1834									
VR	0.353									
Configu	ration Cha	aracteris	tics							
Minimum m	aneuver lanes, I	$N_{WL}$		2 lc	Minimum we	eaving lane ch	nanges, LC <sub>MIN</sub>		1834 lc/h	
Interchange	e density, ID			0.8 int/mi	Weaving lan	e changes, L	$C_W$		2030 lc/h	
Minimum R	F lane changes,	$LC_RF$		1 lc/pc	Non-weaving	g lane change	es, LC <sub>NW</sub>		934 lc/h	
Minimum F	R lane changes,	$LC_FR$		1 lc/pc	Total lane ch	nanges, LC <sub>ALI</sub>	L		2964 lc/h	
Minimum R	R lane changes,	$LC_{RR}$		lc/pc	Non-weaving	g vehicle inde	ex, I <sub>NW</sub>		407	
Weavin	g Segment	Speed,	Density, I	_evel of	Service,	and Cap	acity			
Weaving se	gment flow rate,	V		5189 pc/h		ensity factor,			0.384	
Weaving se	egment capacity,	$c_{w}$		5608 veh/h	1 ,	gment speed,			41.3 mph	
Weaving se	egment v/c ratio			0.890	*	aving speed,	**		47.5 mph	
	egment density, I	)	4	1.9 pc/mi/ln	1	n-weaving spe	1444		38.5 mph	
Level of Se	rvice, LOS			E	Maximum we	eaving length	ı, L <sub>MAX</sub>		6164 f	
Notes										
Chapter 13, '	egments longer the Freeway Merge a es that exceed the	ind Diverge Se weaving segr	gments".	· ·		solated merge	and diverge are	eas using the	procedures of	

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed	AJR Atkins 7/25/2014		Highway/Direction of Trave From/To Jurisdiction	3080-M Internat	ontague to
Analysis Time Period	AM Peak		Analysis Year	Site	and - Miver Cerner
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plar	nning Data
Flow Inputs Volume, V	3283	veh/h	Peak-Hour Factor, PHF	0.90	
AADT Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/day	%Trucks and Buses, P <sub>T</sub> %RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	9 0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub> E <sub>T</sub>	1.00 1.5		$E_R$ $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1.2 0.957	
Speed Inputs			Calc Speed Adj and		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f <sub>LW</sub>		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured) Base free-flow Speed, BFFS	60.0	mph mph	FFS	60.0	mph
LOS and Performanc	e Measures	3	Design (N)		
Operational (LOS)  v <sub>p</sub> = (V or DDHV) / (PHF x   x f <sub>p</sub> ) S D = v <sub>p</sub> / S LOS	N x f <sub>HV</sub> 1906 58.3 32.7 D	pc/h/ln mph pc/mi/ln	Design (N) Design LOS $v_p = (V \text{ or DDHV}) / (PHF \text{ x} \text{ x } f_p)$ S $D = v_p / S$ Required Number of Lanes		pc/h/ln mph pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed DDHV - Directional design	BFFS - Ba		$E_R$ - Exhibits 11-10, 11-12 $E_T$ - Exhibits 11-10, 11-11, $f_p$ - Page 11-18 LOS, S, FFS, $v_p$ - Exhibits 11-3	11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed	AJR Atkins 7/25/2014 PM Peak		Highway/Direction of Trave From/To Jurisdiction Analysis Year	3080-M Internat	ontague to
Project Description Navy			7 thatyono i car	Site	
✓ Oper.(LOS)	Dase ICT		Des.(N)	□ Dlar	nning Data
Flow Inputs			7CS.(IV)	гіаі	Illing Data
Volume, V AADT Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D	3447	veh/h veh/day veh/h	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub> %RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0.90 9 0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub> E <sub>T</sub>	1.00 1.5		$E_R$ $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1.2 1)] 0.957	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance Number of Lanes, N Total Ramp Density, TRD FFS (measured) Base free-flow Speed,	2 60.0	ft ramps/mi mph	f <sub>LW</sub> f <sub>LC</sub> TRD Adjustment FFS	60.0	mph mph mph mph
BFFS		mph			
LOS and Performanc	e Measures	3	Design (N)		
Operational (LOS) $v_p = (V \text{ or DDHV}) / (PHF x)$ $x f_p)$ $S$ $D = v_p / S$ $LOS$	N x f <sub>HV</sub> 2001 57.1 35.1 E	pc/h/ln mph pc/mi/ln	$\frac{\text{Design (N)}}{\text{Design LOS}}$ $v_p = (V \text{ or DDHV}) / (PHF \text{ x})$ $x f_p)$ $S$ $D = v_p / S$ Required Number of Lanes		pc/h/ln mph pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed DDHV - Directional design	BFFS - Ba		$E_R$ - Exhibits 11-10, 11-12 $E_T$ - Exhibits 11-10, 11-11, $f_p$ - Page 11-18 LOS, S, FFS, $v_p$ - Exhibits 11-3	11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1

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General In	formation	13/3/11/1	S AND RAM	Site Infor							
Analyst	AJR		E.	eeway/Dir of Tr		I-526 EI	D.				
Agency or Comp				nction				ternationalWB			
ate Performed	•	5/2014		risdiction		3030-L		terriationalivib			
analysis Time Pe		Peak		nalysis Year		2018 Bi	ıild - River	Center Site			
	on Navy Base IC		7 1	naryoro i oai		2010 01	alia Ttivoi	CONTON CITO			
nputs											
Upstream A	ıdi Ramn	Freeway Num	ber of Lanes, N	2					Downstre	am Adi	
<u>.</u>	_	Ramp Numbe	r of Lanes, N	1					Ramp	anninaj	
□Yes	☐ On	Acceleration L	ane Length, L <sub>A</sub>						□Yes	On	
✓ No	Off	Deceleration L	ane Length L <sub>D</sub>	700					✓ No	Off	
	_	Freeway Volu	me, V <sub>F</sub>	3283							
L <sub>up</sub> =	ft	Ramp Volume	$V_{R}$	629					L <sub>down</sub> =	ft	
\/ <b>-</b>	le /le	Freeway Free	-Flow Speed, S <sub>FF</sub>	60.0					V <sub>D</sub> =	veh/h	
$V_u =$	veh/h	Ramp Free-Fl	ow Speed, S <sub>FR</sub>	25.0					<b>v</b> D —	VCII/II	
Conversio	n to pc/h Un	der Base (	Conditions								
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	fp	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>	
reeway	3283	0.90	Level	9	0	0.9	957	1.00	3	812	
Ramp	629	0.90	Level	8	0	$\overline{}$	962	1.00		27	
JpStream											
DownStream											
		Merge Areas						Diverge Areas			
stimation	of v <sub>12</sub>				Estimat	ion o	f v <sub>12</sub>				
	V <sub>12</sub> = V <sub>F</sub>	(P <sub>FM</sub> )					V <sub>12</sub> =	V <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>	P <sub>ED</sub>		
EQ =	(Equ	ation 13-6 or	13-7)		L <sub>EQ</sub> =			Equation 13-1	–	3)	
= FM =		Equation (E			P <sub>FD</sub> =			000 using Equ			
12 =	pc/h	, , , ,	,		V <sub>12</sub> =			312 pc/h	(=:::	,	
or V <sub>av34</sub>	•	(Equation 13	-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>			pc/h (Equatio	n 13 <sub>-</sub> 14 o	r 13_17)	
	2,700 pc/h? ☐ Ye		14 01 10 17)			> 2.70		Yes ☑ No	11 15-14 0	1 10-17)	
	1.5 * V <sub>12</sub> /2										
			-16, 13-18, or			-		Yes VNo	12 16 12	19 or 13	
Yes,V <sub>12a</sub> =	13-19	: •	-10, 13-10, 01		If Yes,V <sub>12a</sub> =	:		9)	15-10, 15	1-10, UI 13 <sup>.</sup>	
Capacity C	Checks	,			Capacit	y Che	ecks	,			
	Actual	С	apacity	LOS F?			Actual	Ca	pacity	LOS F	
					V <sub>F</sub>		3812	Exhibit 13-8	4600	No	
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$	- V <sub>D</sub>	3085	Exhibit 13-8	4600	No	
10					V <sub>R</sub>	IX	727	Exhibit 13-1	+	No	
Joy Entor	ring Merge II	nfluonoo A	<u></u>			torin		rge Influen		110	
TOW LINE	Actual		Desirable	Violation?	FIOW EII		Actual	Max Desirab		Violation	
V <sub>R12</sub>	/ totual	Exhibit 13-8	200110010	violation:	V <sub>12</sub>	_	812	Exhibit 13-8	4400:All	No	
	ervice Deteri		if not E)								
								termination	_ `	ı-)	
	+ 0.00734 v <sub>R</sub> +	0.0078 V <sub>12</sub> -	U.UU02/ LA		1			.0086 V <sub>12</sub> - 0.0	DO9 LD		
$_{R}$ = (pc/m					l ''	).7 (pc/	,				
OS = (Exhi	ibit 13-2)					<u> </u>	oit 13-2)				
	ermination				Speed L	Deteri	minatio	on			
Speed Det	it 13-11)				$D_s = 0.$	623 (Ex	khibit 13-	-12)			
	nt 10-11 <i>)</i>					S <sub>R</sub> = 48.8 mph (Exhibit 13-12)					
1 <sub>S</sub> = (Exib	•				$S_R = 48$	o.o mpn		10-12)			
$I_S = (Exib)$	Exhibit 13-11)				1		(Exhibit	*			
$I_S = $ (Exib $I_R = $ mph (I	•				$S_0 = N$	/A mph	•	13-12)			

F-3935

General In	formation	1 AZAIVII V	S AND RAM	Site Infor								
Analyst	AJR		E,	eeway/Dir of Tr		I-526 EI	D.					
Agency or Comp				eeway/Dil 01 11				ternationalWB				
ate Performed	=	5/2014		risdiction		3030-L		terriationalivib				
analysis Time Pe		Peak		nalysis Year		2018 Ri	ıild - River	Center Site				
	on Navy Base IC		7 11	laryolo i oai		2010 00	ulia Trivel	OCHICI OILO				
nputs												
Upstream A	di Ramo	Freeway Num	per of Lanes, N	2					Downstre	am Adi		
	_	Ramp Number	of Lanes, N	1					Ramp	anninaj		
□Yes	□ On	Acceleration L	ane Length, L <sub>A</sub>						□Yes	On		
✓ No	Off	Deceleration L	ane Length L <sub>D</sub>	700					✓ No	Off		
		Freeway Volui	ne, V <sub>F</sub>	3447								
L <sub>up</sub> =	ft	Ramp Volume	, V <sub>R</sub>	646					L <sub>down</sub> =	ft		
\/ -	1.0	Freeway Free	Flow Speed, S <sub>FF</sub>	60.0					V <sub>D</sub> =	veh/h		
$V_u =$	veh/h	Ramp Free-Fle	ow Speed, S <sub>FR</sub>	25.0					<b>v</b> D —	VCII/II		
Conversio	n to pc/h Un											
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	fp	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>		
reeway	3447	0.90	Level	9	0	0.9	957	1.00	4	002		
Ramp	646	0.90	Level	7	0	$\neg$	966	1.00		'43		
JpStream												
DownStream												
		Merge Areas						Diverge Areas				
stimation	of v <sub>12</sub>				Estimat	ion o	f v <sub>12</sub>					
	V <sub>12</sub> = V <sub>F</sub>	(P <sub>FM</sub> )					V <sub>12</sub> =	V <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>	P <sub>FD</sub>			
EQ =	(Equ	ation 13-6 or	13-7)		L <sub>EQ</sub> =			Equation 13-1		3)		
= FM =		Equation (E			P <sub>FD</sub> =			000 using Equ				
12 =	pc/h	, , ,	,		V <sub>12</sub> =			)02 pc/h	(=:::	,		
or V <sub>av34</sub>	•	(Equation 13-	.14 or 13 <sub>-</sub> 17)		V <sub>3</sub> or V <sub>av34</sub>			pc/h (Equatio	n 13 <sub>-</sub> 14 o	r 13_17)		
	2,700 pc/h? ☐ Ye		14 01 10 17)			> 2.70		Yes ☑ No	11 15-14 0	1 13-17)		
	1.5 * V <sub>12</sub> /2											
			-16, 13-18, or					Yes VNo	13 16 13	110 or 13		
Yes,V <sub>12a</sub> =	13-19	: •	10, 13-10, 01		If Yes,V <sub>12a</sub> =	=		9)	15-10, 10	)-10, UI 13		
Capacity C	hecks	,			Capacit	y Che	ecks	,				
	Actual	C	apacity	LOS F?			Actual	Ca	pacity	LOS F		
					V <sub>F</sub>		4002	Exhibit 13-8	4600	No		
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$	- V <sub>D</sub>	3259	Exhibit 13-8	4600	No		
10					V <sub>R</sub>	IX	743	Exhibit 13-1		No		
Joy Entor	ring Merge II	nfluonoo A	roo			torin		rge Influen		110		
TOW LINE	Actual		Desirable	Violation?	FIOW EI		Actual	Max Desirab		Violation		
V <sub>R12</sub>	7.0.00	Exhibit 13-8		VIOIGGOTT:	V <sub>12</sub>	$\overline{}$	002	Exhibit 13-8	4400:All	No		
	ervice Deteri		f not E)		+			termination				
									_	<i>r)</i>		
	+ 0.00734 v <sub>R</sub> +	0.0078 V <sub>12</sub> -	0.00627 L <sub>A</sub>		1			.0086 V <sub>12</sub> - 0.0	009 L <sub>D</sub>			
$l_R = (pc/m)$					l ''	2.4 (pc/	,					
`	bit 13-2)				-	`	oit 13-2)					
Speed Det	ermination				Speed L	Deteri	minatio	on				
	it 13-11)				$D_s = 0.$	625 (Ex	khibit 13-	-12)				
N <sub>S</sub> = (Exib					S <sub>R</sub> = 48.8 mph (Exhibit 13-12)							
	Exhibit 13-11)				PR +0	J. 0 111p11	(					
<sub>R</sub> = mph (	•						•	*				
$t_{R} = mph (l)$	Exhibit 13-11) Exhibit 13-11) Exhibit 13-13)				$S_0 = N$	/A mph	•	13-12)				

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	3095- In On	ter WB Off to Inter
Date Performed	7/25/2014		Jurisdiction	On	
Analysis Time Period	AM Peak		Analysis Year	2018 Bu Site	ıild - River Center
Project Description Navy	Base ICTF				
☑ Oper.(LOS)			Des.(N)	☐ Plar	ning Data
Flow Inputs					
Volume, V AADT	2654	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 10	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length	Level mi	
Coloulata Flavr Adius	tmonto		Up/Down %		
Calculate Flow Adjus					
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$		
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		$f_{LC}$		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performanc	e Measures	3	Design (N)		
			Design (N)		
Operational (LOS)	N £		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x I)$	1548	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	A- A-
$x f_p$	60.0	ما سمی	$x f_p$		pc/h/ln
S	60.0	mph	s		mph
$D = v_p / S$	25.8	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	С		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed			f Eyhihit 14.0
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>p</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18	11.0	TRD - Page 11-11
speed	la		LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-∠,	
DDHV - Directional design	nour volume		I - J		

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>I-526 El</i>	В
Agency or Company	Atkins		From/To	3095- Ir	nter WB Off to Inter
Date Performed	7/25/2014		Jurisdiction	On	
Analysis Time Period	PM Peak		Analysis Year	2018 Bu Site	uild - River Center
Project Description Navy	Base ICTF			Site	
✓ Oper.(LOS)			Des.(N)	Plar	nning Data
Flow Inputs			. ,		
Volume, V	2801	veh/h	Peak-Hour Factor, PHF	0.90	
AADT		veh/day	%Trucks and Buses, $P_T$	9	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments		·		
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1)] 0.957	
Speed Inputs			Calc Speed Adj and		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f <sub>LW</sub>		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph		60.0	•
Base free-flow Speed,		•	FFS	60.0	mph
BFFS		mph			
LOS and Performanc	e Measures	<u> </u>	Design (N)		
Operational (LOS)			Design (N)		
v = (\/ or DDH\/) / (PHF v	N v f		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x)$	1N A 1 <sub>HV</sub> 1626	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	$N \times f_{HV}$	no/b/ln
x f <sub>p</sub> )	60.0	ma m la	$x f_p$		pc/h/ln
S / S	60.0	mph	s		mph
$D = v_p / S$	27.1	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	D		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed	E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens		'`		_***
v <sub>n</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	, 11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18	44.0	TRD - Page 11-1
speed			LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	
DDHV - Directional design	hour volume		11-3		

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			REEWAY	WEAV	0		T			
Genera	l Information	on			Site Info	rmation				
Analyst Agency/Col Date Perfor Analysis Tir	med ne Period	AJR Atkins 7/25/20 AM Pea			Freeway/Dir of Travel I-526 EB Weaving Segment Location 3100 - International to I-26 Analysis Year 2018 Build - River Center Site					
Inputs	cription Navy Ba	ase icir								
Weaving se Freeway fre	umber of lanes, Negment length, Lege-flow speed, Ff	S FS		2025ft 55 mph	Segment typ Freeway min Freeway max Terrain type	imum speed			Freeway 15 2250 Leve	
Conver	sions to po	T .	ľ	l.	li .					
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	ER	f <sub>HV</sub>	fp	v (pc/h)	
$V_{FF}$	1233	0.90	10	0	1.5	1.2	0.952	1.00	1439	
$V_{RF}$	589	0.90	10	0	1.5	1.2	0.952	1.00	687	
$V_{FR}$	1421	0.90	11	0	1.5	1.2	0.948	1.00	1666	
$V_{RR}$	678	0.90	11	0	1.5	1.2	0.948	1.00	795	
$V_{NW}$	2234			-	-	-		V =	4587	
$V_{W}$	2353									
VR	0.513									
Configu	uration Cha	aracteris	tics							
Minimum m	naneuver lanes, I	N <sub>WL</sub>		3 lc	Minimum we	eaving lane cl	hanges, LC <sub>MIN</sub>		687 lc/h	
Interchange	e density, ID			1.0 int/mi	Weaving lan	e changes, L	.C <sub>w</sub>		941 lc/h	
Minimum R	RF lane changes,	$LC_{RF}$		1 lc/pc	Non-weaving	g lane chang	es, LC <sub>NW</sub>		980 lc/h	
Minimum F	R lane changes,	$LC_{FR}$		0 lc/pc	Total lane ch	nanges, LC <sub>AL</sub>	L		1921 lc/h	
Minimum R	RR lane changes,	, LC <sub>RR</sub>		lc/pc	Non-weaving	g vehicle inde	ex, I <sub>NW</sub>		452	
Weavin	g Segment	t Speed,	Density, I	Level of	Service,	and Cap	pacity			
Weaving se	egment flow rate			4587 pc/h 5469 veh/h	Weaving seg	ensity factor, gment speed	, S		0.217 45.2 mph	
	egment v/c ratio	5	•	0.799	Average wea		**		47.9 mph	
Weaving se Level of Se	egment density, I	ט	33	3.8 pc/mi/ln	Average non		1111		42.7 mph	
	SI VICE, LUS			D	Maximum we	eaving length	ı, L <sub>MAX</sub>		6412 ft	
Chapter 13,	segments longer the "Freeway Merge a es that exceed the	and Diverge Se	gments".			solated merge	and diverge ar	eas using the	procedures of	

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_			REEWAY	WEAV	v		Т		
Genera	l Information	on			Site Info	rmation			
Analyst Agency/Cor Date Perfor Analysis Tir Project Des	med	AJR Atkins 7/25/20 PM Pea			Freeway/Dir Weaving Seç Analysis Yea	gment Location		EB - Internationa Build - River	
Inputs									
Weaving se Freeway fre	imber of lanes, N gment length, L <sub>s</sub> ee-flow speed, FF	S S		One-Sided 3 2025ft 55 mph	Terrain type				Freewa 1 225 Leve
Conver	sions to po	1	ľ	ľ	11	1			
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	$f_{HV}$	fp	v (pc/h)
$V_{FF}$	1352	0.90	9	0	1.5	1.2	0.957	1.00	1570
$V_{RF}$	911	0.90	9	0	1.5	1.2	0.957	1.00	1058
$V_{FR}$	1449	0.90	9	0	1.5	1.2	0.957	1.00	1682
$V_{RR}$	977	0.90	9	0	1.5	1.2	0.957	1.00	1134
$V_{NW}$	2704							V =	5444
$V_W$	2740								
VR	0.503								
Configu	ration Cha	aracterist	tics						
Minimum m	naneuver lanes, I	N <sub>WL</sub>		3 lc	Minimum we	eaving lane cl	nanges, LC <sub>MIN</sub>		1058 lc/h
Interchange	e density, ID			1.0 int/mi	Weaving lan	e changes, L	$C_W$		1312 lc/h
Minimum R	F lane changes,	$LC_RF$		1 lc/pc	Non-weaving	g lane chang	es, LC <sub>NW</sub>		1077 lc/h
Minimum F	R lane changes,	$LC_FR$		0 lc/pc	Total lane ch	nanges, LC <sub>ALI</sub>	L		2389 lc/h
Minimum R	R lane changes,	$LC_{RR}$		lc/pc	Non-weaving	g vehicle inde	ex, I <sub>NW</sub>		548
Weavin	g Segment	Speed,	Density, I	_evel of	Service,	and Cap	acity		
Weaving se	egment flow rate, egment capacity,			5444 pc/h 5521 veh/h	Weaving seg	ensity factor, gment speed, aving speed,	, S		0.257 42.4 mph 46.8 mph
	egment v/c ratio	2	47	0.944	l *	•	**		•
Level of Se	egment density, [ rvice   LOS	J	42	2.8 pc/mi/ln E	Average nor		1444		38.7 mpl
	I VIOE, LOO				iviaximum w	eaving length	I, L <sub>MAX</sub>		6299 f
Chapter 13, '	segments longer the "Freeway Merge a es that exceed the	and Diverge Se	gments".	-		solated merge	and diverge are	eas using the	procedures of

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	3105-I-2 On	26 Off to I-26 EB CD
Date Performed	7/25/2014		Jurisdiction	OII	
Analysis Time Period	AM Peak		Analysis Year	2018 Bu Site	ıild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	□Plar	nning Data
Flow Inputs					
Volume, V AADT	1822	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 17	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length	0 Level mi	
			Up/Down %		
Calculate Flow Adjus	tments				
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] 0.922	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	55.0	mph	FFS	55.0	mph
Base free-flow Speed, BFFS		mph		00.0	тірт
LOS and Performanc	e Measures	5	Design (N)		
			Design (N)		
Operational (LOS)	N. 6		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x I x f_p)$	N X <sup>f</sup> HV 1098	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	pc/h/ln
S	55.0	mph	x f <sub>p</sub> )		mnh
$D = v_p / S$	20.0	pc/mi/ln	S		mph
LOS	С		$D = v_p / S$ Required Number of Lanes	s. N	pc/mi/ln
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed			
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>p</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service speed		se free-flow	f <sub>p</sub> - Page 11-18 LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	TRD - Page 11-11
DDHV - Directional design	hour volume		11-3		

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>I-526 EE</i>	3
Agency or Company	Atkins		From/To	3105-I-2 On	26 Off to I-26 EB CD
Date Performed	7/25/2014		Jurisdiction	On	
Analysis Time Period	PM Peak		Analysis Year	2018 Bu Site	ıild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			es.(N)	☐ Plar	nning Data
Flow Inputs					
Volume, V AADT	2263	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 15	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length	0 Level mi	
Calculate Flow Adjus	tmonto		Up/Down %		
Calculate Flow Adjus					
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$		
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		$f_{LC}$		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	55.0	mph	FFS	55.0	mph
Base free-flow Speed, BFFS		mph			·
LOS and Performanc	e Measures	5	Design (N)		
			Design (N)		
Operational (LOS)	N. 6		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x I x f_p)$	N x f <sub>HV</sub> 1352	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	pc/h/ln
s	55.0	mph	x f <sub>p</sub> )		
$D = v_p / S$	24.6	pc/mi/ln	S		mph
LOS	С		$D = v_p / S$ Required Number of Lanes	s N	pc/mi/ln
Glossary			Factor Location	,	
N - Number of lanes	S - Spee	-d			
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>p</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service speed		se free-flow	f <sub>p</sub> - Page 11-18 LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	TRD - Page 11-11
DDHV - Directional design	hour volume		11-3	•	

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		MPS AND	RAMP JUN	CTIONS W	ORKSHE	ET		
General Infor	mation			Site Infor	mation			
nalyst	AJR		Fr	eeway/Dir of Tr	avel I	-526 EB		
gency or Company	Atkin	IS	Ju	nction	3	3110-EB On fror	n I-26 EB	
ate Performed	7/25/	/2014		risdiction				
nalysis Time Period			Ar	alysis Year	2	2018 Build - Rive	er Center Site	
roject Description	Navy Base IC	ſF						
nputs								
Ipstream Adj Ramp		Freeway Numb	oer of Lanes, N	2				Downstream Adj
		Ramp Number	of Lanes, N	1				Ramp
☐ Yes ☐ On	١	Acceleration L	ane Length, L <sub>Δ</sub>	625				☐Yes ☐On
	_	Deceleration L	,,					Tes Doll
✓ No ☐ Off	ľ	Freeway Volur		1000				☑ No ☐ Off
= ft		1		1822				L <sub>down</sub> = ft
<sub>up</sub> = ft		Ramp Volume	11	1365				down
'u = veh/h	•	Freeway Free-	Flow Speed, S <sub>FF</sub>	55.0				V <sub>D</sub> = veh/h
u Veriiiri		Ramp Free-Flo	ow Speed, S <sub>FR</sub>	25.0				
Conversion to	o pc/h Une	der Base (	Conditions					•
(pc/h)	V	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	fp	$V = V/PHF \times f_{HV} \times f_{D}$
. ,	(Veh/hr)	-					<u> </u>	· ·
reeway	1822	0.90	Level	17	0	0.922	1.00	2197
Ramp	1365	0.90	Level	53	0	0.791	1.00	1919
JpStream		++						
DownStream		Merge Areas				1	Diverge Areas	
stimation of	F V	WEIGE ALEAS			Fstimati	on of v <sub>12</sub>	Diverge Areas	
.sumation of					LStillati	<u>:=</u> _		
	$V_{12} = V_{F}$	(P <sub>FM</sub> )				V <sub>12</sub> =	· V <sub>R</sub> + (V <sub>F</sub> - V	<sub>R</sub> )P <sub>FD</sub>
EQ =	(Equ	ation 13-6 or	13-7)		L <sub>EQ</sub> =		(Equation 13	3-12 or 13-13)
) <sub>FM</sub> =	1.000	using Equati	on (Exhibit 13-6)		P <sub>FD</sub> =		using Equati	ion (Exhibit 13-7)
' <sub>12</sub> =	2197				V <sub>12</sub> =		pc/h	
' <sub>3</sub> or V <sub>av34</sub>		•	3-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>		•	13-14 or 13-17)
s V <sub>3</sub> or V <sub>av34</sub> > 2,70			0 14 01 10 17)			4 > 2,700 pc/h?		
s V <sub>3</sub> or V <sub>av34</sub> > 1.5 *			16 12 19 or			<sub>4</sub> > 1.5 * V <sub>12</sub> /2		
Yes,V <sub>12a</sub> =	13-19)		-16, 13-18, or		If Yes,V <sub>12a</sub> =		pc/n (⊑qua⊪ 13-19)	on 13-16, 13-18, or
Capacity Che		/			Capacity		10 10)	
aparenty error	Actual	С	apacity	LOS F?		Actua	l C	apacity LOS F?
					V <sub>F</sub>	1.0.00	Exhibit 13	
						1/	Exhibit 13	
$V_{FO}$	4116	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>		
					$V_R$		Exhibit 1	3-
low Entering	n Marga Ir	ofluence A	roa		Flow En	tering Dive		nce Area
TOW LINCING	Actual		Desirable	Violation?	1 TOW LIN	Actual	Max De	
	7101441	Exhibit 13-8	4600:All	No	V <sub>12</sub>	7 totaar	Exhibit 13-8	Violation
	/116	LAHIDIL 10-0		110		Comico D		on (if not F)
V <sub>R12</sub>	4116				Level of			on (if not F)
V <sub>R12</sub> .evel of Serv	ice Detern					4 0 5 0	0 000011	
V <sub>R12</sub> .evel of Serv	ice Detern	<b>mination (i</b> 0.0078 V <sub>12</sub> - 0.0				$O_{R} = 4.252 + 0$	0.0086 V <sub>12</sub> - (	0.009 L <sub>D</sub>
V <sub>R12</sub> .evel of Serv D <sub>R</sub> = 5.475 +	o.00734 v <sub>R</sub> + 0				L	O <sub>R</sub> = 4.252 + ( c/mi/ln)	0.0086 V <sub>12</sub> - (	0.009 L <sub>D</sub>
V <sub>R12</sub> .evel of Serv D <sub>R</sub> = 5.475 +	ice Detern 0.00734 v <sub>R</sub> + ( ni/ln)				$D_R = (p_0)$		0.0086 V <sub>12</sub> - (	0.009 L <sub>D</sub>
V <sub>R12</sub> Level of Serv  D <sub>R</sub> = 5.475 +  d <sub>R</sub> = 32.8 (pc/m  OS = D (Exhibit	ice Detern 0.00734 v <sub>R</sub> + ( ni/ln) 13-2)				D <sub>R</sub> = (po	c/mi/ln) xhibit 13-2)	. <u>-</u>	0.009 L <sub>D</sub>
V <sub>R12</sub> Level of Serv  D <sub>R</sub> = 5.475 +  D <sub>R</sub> = 32.8 (pc/m  OS = D (Exhibit	ice Detern 0.00734 v <sub>R</sub> + ( ni/ln) 13-2) mination				D <sub>R</sub> = (po LOS = (E <b>Speed D</b>	c/mi/ln) xhibit 13-2) <b>eterminati</b>	. <u>-</u>	0.009 L <sub>D</sub>
$V_{R12}$ Level of Serv $D_R = 5.475 + 32.8 \text{ (pc/m}$ $OS = D \text{ (Exhibit)}$ Speed Determ $S_S = 0.529 \text{ (Exil}$	ice Detern 0.00734 v <sub>R</sub> + 0 ni/ln) 13-2) mination bit 13-11)				$D_R = (poly 1)$ LOS = (Expression 1) $D_S = (Expression 1)$	c/mi/ln) xhibit 13-2) <b>eterminati</b> khibit 13-12)	on	0.009 L <sub>D</sub>
$V_{R12}$ Level of Serv. $D_R = 5.475 + 0.000$ $D_R = 5.475 + 0.000$ $D_R = $	ice Detern 0.00734 v <sub>R</sub> + ( ni/ln) 13-2) mination bit 13-11) (Exhibit 13-11)				$D_R$ = (polynomial (polynomial polynomial	c/mi/ln) xhibit 13-2) eterminati khibit 13-12) sh (Exhibit 13-12	<b>ion</b>	0.009 L <sub>D</sub>
V <sub>R12</sub> Level of Serv  D <sub>R</sub> = 5.475 +  R = 32.8 (pc/m  OS = D (Exhibit  Speed Detern  I <sub>S</sub> = 0.529 (Exil  R = 48.1 mph ( 0 = N/A mph (	ice Detern 0.00734 v <sub>R</sub> + 0 ni/ln) 13-2) mination bit 13-11)				$D_R$ = (point of the point of	c/mi/ln) xhibit 13-2) <b>eterminati</b> khibit 13-12)	ion (2)	0.009 L <sub>D</sub>

	RA	MPS AND	RAMP JUN	CTIONS W	/ORKSHE	EET				
General Info		57415		Site Infor						
Analyst	AJR		Fr	eeway/Dir of Tr		I-526 EB				
Agency or Compar	ny Atkin	S	Ju	inction		3110-EB	On from I-	26 EB		
Date Performed	7/25/	2014	Ju	ırisdiction						
Analysis Time Peri			Ar	nalysis Year		2018 Build	d - River C	Center Site		
Project Description	Navy Base IC	ΓF								
nputs		1								
Jpstream Adj Ram	р	Freeway Num	ber of Lanes, N	2					Downstre	am Adj
		Ramp Numbe	r of Lanes, N	1					Ramp	
Yes C	)n	Acceleration L	ane Length, L <sub>A</sub>	625					□Yes	On
✓ No 🗆 C	Off	Deceleration L	ane Length L <sub>D</sub>							_
	211	Freeway Volu	me, V <sub>E</sub>	2263					✓ No	Off
<sub>rup</sub> = ft		Ramp Volume	'	1116					L <sub>down</sub> =	ft
		1	Flow Speed, S <sub>FF</sub>	55.0						
/ <sub>u</sub> = veh	/h	1	ow Speed, S <sub>FR</sub>	25.0					$V_D =$	veh/h
<u> </u>	40 mg/h l lm		111	25.0						
Conversion	to pc/n Und		Sonaitions	1	1	1				
(pc/h)	(Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>H</sub> ,	/	f <sub>p</sub>	v = V/PHI	$F \times f_{HV} \times f_{p}$
Freeway	2263	0.90	Level	15	0	0.930		1.00		2703
Ramp	1116	0.90	Level	55	0	0.784	1	1.00		1581
JpStream										
DownStream										
		Merge Areas					Div	erge Areas		
stimation o	of v <sub>12</sub>				Estimati	ion of v	12			
	V <sub>12</sub> = V <sub>F</sub>	(P <sub>FM</sub> )					V <sub>12</sub> = V <sub>1</sub>	+ (V <sub>F</sub> - V <sub>R</sub> )	P <sub>ED</sub>	
- <sub>EQ</sub> =	(Equ	ation 13-6 or	13-7)		L <sub>EQ</sub> =		(E	quation 13-	12 or 13-1	13)
P <sub>FM</sub> =			ion (Exhibit 13-6)		P <sub>FD</sub> =			ing Equatio		
/ <sub>12</sub> =	2703		, , ,		V <sub>12</sub> =		рс		(	- /
/ <sub>3</sub> or V <sub>av34</sub>		•	13-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>			:/h (Equation 1	3_14 or 13_4	17)
ls V <sub>3</sub> or V <sub>av34</sub> > 2,7			10-14-01-10-17)			> 2 700		Yes No	0 14 01 10	''',
Is $V_3$ or $V_{av34} > 2,1$								Yes No		
			3-16, 13-18, or		1			res	13_16 1	3_18 or
Yes,V <sub>12a</sub> =	13-19)		7-10, 10-10, 01		If Yes,V <sub>12a</sub> =		13-		1 13-10, 1	J- 10, OI
Capacity Ch	ecks				Capacity	y Chec	ks	,		
	Actual	С	apacity	LOS F?			Actual	Сар	acity	LOS F?
					V <sub>F</sub>			Exhibit 13-8	3	
$V_{FO}$	4284	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>D</sub>		Exhibit 13-8	3	
*FO	4204	LAHIDIC 13-0		140				Exhibit 13-		
					V <sub>R</sub>			10		
Flow Enterin	ng Merge In	ifluence A	rea		Flow En	tering	Diverg	je Influen	ce Area	1
	Actual	Max I	Desirable	Violation?		Act	ual	Max Desi	rable	Violation?
$V_{R12}$	4284	Exhibit 13-8	4600:AII	No	V <sub>12</sub>			Exhibit 13-8		
Level of Ser	vice Detern	nination (i	if not F)		Level of	Servi	e Dete	erminatio	n (if not	<i>F</i> )
D <sub>R</sub> = 5.475	+ 0.00734 v <sub>R</sub> + 0	0.0078 V <sub>12</sub> - 0.0	00627 L <sub>A</sub>		1	D <sub>R</sub> = 4.2	52 + 0.0	086 V <sub>12</sub> - 0.	009 L <sub>D</sub>	
) <sub>R</sub> = 34.2 (pc/					L	c/mi/ln)				
OS = D (Exhib	· ·					xhibit 13	3-2)			
Speed Deter	-				Speed D			,		
-					<del>                                     </del>					
•	xibit 13-11)				l °	xhibit 13-1	-			
	n (Exhibit 13-11)				I .,	ph (Exhibit	•			
	(Exhibit 13-11)				ľ	ph (Exhibit				
S = 47.6 mpl	n (Exhibit 13-13)					ph (Exhibit				
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			REEWAY	WEAV			T		
Genera	l Informati	on			Site Info	rmation			
Analyst Agency/Cor Date Perfor Analysis Tin Project Des	med	AJR Atkins 7/25/20 AM Pea			Freeway/Dir Weaving Seg Analysis Yea	gment Location		EB - I-26 WB to I Build - River	
Inputs	,								
Weaving se Freeway fre	mber of lanes, N gment length, L e-flow speed, Fl	s FS		One-Sided 3 1615ft 55 mph	Segment typ Freeway min Freeway max Terrain type	imum speed,			Freewa 1 225 Leve
Conver	sions to po	c/h Unde	r Base Co	ndition	S				
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	$f_{HV}$	fp	v (pc/h)
$V_{FF}$	2981	0.90	17	0	1.5	1.2	0.922	1.00	3594
$V_{RF}$	467	0.90	17	0	1.5	1.2	0.922	1.00	563
$V_{FR}$	206	0.90	19	0	1.5	1.2	0.913	1.00	251
$V_{RR}$	32	0.90	19	0	1.5	1.2	0.913	1.00	39
$V_{NW}$	3633							V =	4447
$V_W$	814								
VR	0.183								
Configu	ration Cha	aracterist	ics						
Minimum m	aneuver lanes,	N <sub>WL</sub>		2 lc	Minimum we	aving lane cl	hanges, LC <sub>MIN</sub>		814 lc/h
Interchange	e density, ID			1.2 int/mi	Weaving lan	e changes, L	.C <sub>w</sub>		1053 lc/h
Minimum R	F lane changes,	, LC <sub>RF</sub>		1 lc/pc	Non-weaving	g lane chang	es, LC <sub>NW</sub>		1046 lc/h
Minimum F	R lane changes,	, LC <sub>FR</sub>		1 lc/pc	Total lane ch	nanges, LC <sub>ALI</sub>	L		2099 lc/h
Minimum R	R lane changes	, LC <sub>RR</sub>		lc/pc	Non-weaving	g vehicle inde	ex, I <sub>NW</sub>		704
Weavin	g Segmen	t Speed,	Density, I	_evel of	Service,	and Cap	acity		
Weaving se	egment flow rate	, V		4447 pc/h	Weaving inte	ensity factor,	W		0.278
Weaving se	egment capacity	, c <sub>w</sub>		5641 veh/h	1 ,	gment speed			42.7 mph
Weaving se	egment v/c ratio			0.727	Average wea	aving speed,	$S_W$		46.3 mph
_	egment density,	D	34	1.7 pc/mi/ln	Average nor	n-weaving sp	eed, S <sub>NW</sub>		42.0 mph
Level of Se	rvice, LOS			D	Maximum w	eaving length	ı, L <sub>MAX</sub>		4364 ff
Notes									
Chapter 13, '	egments longer to Freeway Merge a es that exceed the	and Diverge Se	gments".			solated merge	and diverge are	eas using the	procedures of

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			REEWA	WEAV	ING WOF	RKSHEE	T		
General	Information	on			Site Info	rmation			
	med	AJR Atkins 7/25/20 PM Pe			Freeway/Dir Weaving Seg Analysis Yea	gment Location		EB - I-26 WB to Build - River	
Inputs					1				
Weaving se Freeway fre	mber of lanes, N gment length, L <sub>o</sub> e-flow speed, Fl	S S		1615ft 55 mph	Segment typ Freeway min Freeway max Terrain type	imum speed			Freewa 1 225 Leve
Conver	sions to po	/h Unde	r Base Co	ndition	S	1			
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	f <sub>HV</sub>	fp	v (pc/h)
$V_{FF}$	3047	0.90	15	0	1.5	1.2	0.930	1.00	3639
$V_{RF}$	405	0.90	15	0	1.5	1.2	0.930	1.00	484
$V_{FR}$	332	0.90	15	0	1.5	1.2	0.930	1.00	397
$V_{RR}$	44	0.90	10	0	1.5	1.2	0.952	1.00	51
$V_{NW}$	3690							V =	4571
V <sub>W</sub>	881								
VR	0.193								
Configu	ration Cha	aracteris	tics						
Minimum m	aneuver lanes, l	N <sub>WL</sub>		2 lc	Minimum we	aving lane c	hanges, LC <sub>MIN</sub>		881 lc/h
Interchange	e density, ID			1.2 int/mi	Weaving lan	e changes, L	.C <sub>w</sub>		1120 lc/h
Minimum R	F lane changes,	$LC_RF$		1 lc/pc	Non-weaving	g lane chang	es, LC <sub>NW</sub>		1058 lc/h
Minimum Fl	R lane changes,	$LC_FR$		1 lc/pc	Total lane ch	nanges, LC <sub>AL</sub>	L		2178 lc/h
Minimum R	R lane changes,	, LC <sub>RR</sub>		lc/pc	Non-weaving	g vehicle inde	ex, I <sub>NW</sub>		715
Weavin	g Segment	t Speed,	Density, I	Level of	Service,	and Cap	pacity		
Weaving se	egment flow rate	, V		4571 pc/h	Weaving inte	ensity factor,	W		0.286
Weaving se	gment capacity,	C <sub>w</sub>		5671 veh/h	Weaving seg				42.2 mph
Weaving se	egment v/c ratio			0.750	Average wea	aving speed,	$S_W$		46.1 mph
_	egment density, I	D	30	6.1 pc/mi/ln	Average non		1111		41.3 mph
Level of Se	rvice, LOS			Е	Maximum we	eaving length	i, L <sub>MAX</sub>		4462 f
Notes									
Chapter 13, "	egments longer to Freeway Merge a es that exceed the	and Diverge Se	egments".			solated merge	and diverge are	eas using the	procedures of

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		RAMP	S AND RAM	IP JUNCTI	ONS WC	ORKS	HEET			
General In:	formation			Site Infor						
Analyst	AJR		F	reeway/Dir of Tr	avel	I-526 I	ΞB			
Agency or Comp	=			unction	3130-EB Off to Rivers NB					
Date Performed		/2014	-	urisdiction						
Analysis Time Pe			A	nalysis Year		2018 E	Build - Rive	Center Site		
	ion Navy Base IC	l F								
Inputs		Eroowov Num	nber of Lanes, N	2					<u> </u>	
Upstream A	Adj Ramp	1 '							Downstrea	ım Adj
□Yes	□On	Ramp Numbe	•	1					Ramp	
□ 163		1	Lane Length, L <sub>A</sub>						□Yes	On
✓ No	Off	Deceleration	Lane Length L <sub>D</sub>	800					✓No	Off
		Freeway Volu	ıme, V <sub>F</sub>	3448						
L <sub>up</sub> =	ft	Ramp Volume	e, V <sub>R</sub>	161					L <sub>down</sub> =	ft
		Freeway Free	e-Flow Speed, S <sub>FF</sub>	55.0					V <sub>D</sub> =	veh/h
$V_u =$	veh/h	Ramp Free-F	low Speed, S <sub>FR</sub>	25.0					V <sub>D</sub> –	ven/m
Conversio	n to pc/h Un	der Base	Conditions							
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	f <sub>p</sub>	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>
Freeway	3448	0.90	Level	17	0	0	.922	1.00	41	57
Ramp	161	0.90	Level	23	0	0	.897	1.00	19	99
UpStream										
DownStream										
<b>-</b>		Merge Areas			F 4: 4			Diverge Areas		
Estimation	1 of V <sub>12</sub>				Estimat	tion (				
	$V_{12} = V_{F}$	$(P_{FM})$					V <sub>12</sub> =	V <sub>R</sub> + (V <sub>F</sub> - V	<sub>R</sub> )P <sub>FD</sub>	
- <sub>EQ</sub> =	(Equa	ation 13-6 or	13-7)		L <sub>EQ</sub> =		(	Equation 13-	12 or 13-13	)
P <sub>FM</sub> =	using	Equation (	Exhibit 13-6)		P <sub>FD</sub> =		1.	000 using Eq	uation (Exhi	bit 13-7)
V <sub>12</sub> =	pc/h				V <sub>12</sub> =		4	157 pc/h		
V <sub>3</sub> or V <sub>av34</sub>	pc/h (	Equation 13	3-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>		0	pc/h (Equation	on 13-14 or	13-17)
	2,700 pc/h? ☐ Ye		•			,34 > 2,		☐Yes ☑ No		,
	1.5 * V <sub>12</sub> /2 ☐ Ye							☐Yes ☑ No		
			3-16, 13-18, or					c/h (Equation	ı 13-16, 13-	18, or 13-
f Yes,V <sub>12a</sub> =	13-19				If Yes,V <sub>12a</sub> :			9) ` '		
Capacity C	Checks	0			Capacit	ty Ch	ecks	V-		
	Actual		Capacity	LOS F?			Actual		apacity	LOS F
					V <sub>F</sub>		4157	Exhibit 13-	8 4500	No
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$	- V <sub>R</sub>	3958	Exhibit 13-	8 4500	No
					$V_R$		199	Exhibit 13-1	0 1900	No
Flow Enter	ring Merge In	fluence A	Area	-	Flow Er	nterii	ng Dive	rge Influen	ce Area	
	Actual	Max	Desirable	Violation?			Actual	Max Desira	ble	Violation <sup>4</sup>
$V_{R12}$		Exhibit 13-8			V <sub>12</sub>		4157	Exhibit 13-8	4400:All	No
Level of Se	ervice Detern	nination (	if not F)	•	Level o	f Ser	vice De	terminatio	n (if not l	F)
D <sub>R</sub> = 5.475 -	+ 0.00734 v <sub>R</sub> +	0.0078 V <sub>12</sub>	- 0.00627 L <sub>A</sub>			D <sub>R</sub> =	4.252 + 0	.0086 V <sub>12</sub> - 0	.009 L <sub>D</sub>	
O <sub>R</sub> = (pc/m		12	,,				c/mi/ln)	12	2	
	, ibit 13-2)				l .,		bit 13-2)			
` .	ermination				Speed L	•		on		
	oit 13-11)				<del>  '</del>		xhibit 13			
•	•					-	h (Exhibit			
	Exhibit 13-11)					-	(Exhibit	*		
	Exhibit 13-11)					-	•	•		
, ,	Exhibit 13-13)						h (Exhibit			
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		RAMP	S AND RAM	IP JUNCTI	ONS WC	ORKS	HEET			
General In	formation			Site Infor						
Analyst	AJR		F	reeway/Dir of Tr	avel	I-526 I	ΞB			
Agency or Comp	=			unction	3130-EB Off to Rivers NB					
Date Performed		/2014	•	urisdiction						
Analysis Time P			A	nalysis Year		2018 E	Build - Rive	Center Site		
Project Descripti <b>Inputs</b>	ion Navy Base IC	IF.								
•		Erooway Nur	nber of Lanes, N	2						
Upstream A	Adj Ramp	Ramp Number							Downstrea	ım Adj
□Yes	□On	I '	•	1					Ramp	
		1	Lane Length, L <sub>A</sub>						□Yes	On
✓ No	Off	1	Lane Length L <sub>D</sub>	800					✓No	Off
	-	Freeway Volu		3452					_	ft
L <sub>up</sub> =	ft	Ramp Volume	13	343	343					IL
V <sub>u</sub> =	veh/h		e-Flow Speed, S <sub>FF</sub>	55.0					V <sub>D</sub> =	veh/h
<b>*</b> u	VCII/II	Ramp Free-F	low Speed, S <sub>FR</sub>	25.0						
Conversio	n to pc/h Un	der Base	Conditions							
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		$f_{HV}$	f <sub>p</sub>	v = V/PHF	$x f_{HV} x f_{p}$
Freeway	3452	0.90	Level	15	0	0	.930	1.00	41	23
Ramp	343	0.90	Level	9	0	0	.957	1.00	39	98
UpStream						$\bot$				
DownStream		Merge Areas					-	Diverge Areas		
Estimation		Weige Aleas			Estimat	tion (	of V.	iverge Areas		
		/ D \							\D	
_	$V_{12} = V_F$		10.7)		<u> </u>			V <sub>R</sub> + (V <sub>F</sub> - V		
-EQ =		ation 13-6 or			L <sub>EQ</sub> =			Equation 13-1		
P <sub>FM</sub> =	_	Equation (	Exhibit 13-6)		P <sub>FD</sub> =			000 using Eq	uation (Exhi	bit 13-7)
/ <sub>12</sub> =	pc/h				V <sub>12</sub> =			123 pc/h		
$V_3$ or $V_{av34}$			-14 or 13-17)		$V_3$ or $V_{av34}$			pc/h (Equation	on 13-14 or	13-17)
	2,700 pc/h? ☐ Ye							☐Yes ☑ No		
Is $V_3$ or $V_{av34} >$	1.5 * V <sub>12</sub> /2				Is V <sub>3</sub> or V <sub>av</sub>	<sub>/34</sub> > 1.		☐Yes ☑ No		
f Yes,V <sub>12a</sub> =	pc/h ( 13-19)		-16, 13-18, or		If Yes,V <sub>12a</sub> :	=		oc/h (Equation 9)	13-16, 13-	18, or 13
Capacity C		/			Capacit	tv Ch		<u> </u>		
- up a c 1 c y	Actual		Capacity	LOS F?		,	Actual	Ca	apacity	LOS F
					V <sub>F</sub>		4123	Exhibit 13-		No
$V_{FO}$		Exhibit 13-8			V <sub>FO</sub> = V <sub>F</sub>		3725	Exhibit 13-	8 4500	No
FO					V <sub>R</sub>		398	Exhibit 13-1	_	No
Elow Entor	ring Merge In	fluonoo	l roo					rge Influen		110
10W LINE	Actual		Desirable	Violation?	I IOW LI	10111	Actual	Max Desiral		Violation
V <sub>R12</sub>		Exhibit 13-8			V <sub>12</sub>	$\top$	4123	Exhibit 13-8	4400:All	No
	ervice Detern		if not F)		·			terminatio	<u> </u>	
	+ 0.00734 v <sub>R</sub> +				-			.0086 V <sub>12</sub> - 0.		,
D <sub>R</sub> = (pc/m		0.0070 112	0.00027 L <sub>A</sub>		1			.0000 112 0.	.000 Д	
* *	ibit 13-2)				l		:/mi/ln)			
	· · · · · · · · · · · · · · · · · · ·					•	bit 13-2)	<u> </u>		
	ermination				Speed I					
•	oit 13-11)				1	-	xhibit 13			
	Exhibit 13-11)					-	n (Exhibit	-		
	Exhibit 13-11)				$S_0$ = N/A mph (Exhibit 13-12)					
· '	Exhibit 13-13)						n (Exhibit	-		
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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>I-526 El</i>	 3
Agency or Company	Atkins		From/To		versNB Off to
Date Performed	7/25/2014		Jurisdiction	Rivers (	)n
Analysis Time Period	AM Peak		Analysis Year	2018 Βι Site	ıild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plar	nning Data
Flow Inputs					
Volume, V	3287	veh/h	Peak-Hour Factor, PHF	0.90	
AADT		veh/day	%Trucks and Buses, $P_T$	17	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain:	Level	
DDHV - AADIXKXD		ven/m	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments		·		
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
Γ E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$		
Speed Inputs			Calc Speed Adj and		
Lane Width		ft	Gaio opeca Aaj ana		
Rt-Side Lat. Clearance		ft			
Number of Lanes, N	2	11	f <sub>LW</sub>		mph
Total Ramp Density, TRD	۷	romno/mi	f <sub>LC</sub>		mph
	55.0	ramps/mi	TRD Adjustment		mph
FFS (measured) Base free-flow Speed,	55.0	mph	FFS	55.0	mph
BFFS		mph			
LOS and Performanc	e Measures	3	Design (N)		
			Design (N)		
Operational (LOS)			Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub> 1981	pc/h/ln	$v_n = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>LIV</sub>	
x f <sub>p</sub> )		F -	x f <sub>p</sub> )	п۷	pc/h/ln
S	54.2	mph	S P		mph
$D = v_p / S$	36.6	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	E		Required Number of Lanes	s. N	ролили
Glossary			Factor Location	- ,	
N - Number of lanes	S - Spee	ed .			
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>n</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18		TRD - Page 11-11
speed	20 00	.50 1100 11044	LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	
DDHV - Directional design	hour volume		11-3		
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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>I-526 El</i>	 B
Agency or Company	Atkins		From/To	3135-R	iversNB Off to
Date Performed	7/25/2014		Jurisdiction	Rivers (	<i>S</i> n
Analysis Time Period	PM Peak		Analysis Year	2018 Bu Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	3109	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 15	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi	
Calculate Flow Adjus	tments		·		
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
Ε <sub>Τ</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$		
Speed Inputs	1.0		Calc Speed Adj and		
Lane Width		ft	Oale Opeeu Auj allu l		
Rt-Side Lat. Clearance		ft			and b
Number of Lanes, N	2	11	f <sub>LW</sub>		mph
Total Ramp Density, TRD	_	ramps/mi	f <sub>LC</sub>		mph
FFS (measured)	55.0	mph	TRD Adjustment		mph
Base free-flow Speed,	33.0	·	FFS	55.0	mph
BFFS		mph			
LOS and Performanc	e Measures	3	Design (N)		
			Design (N)		
Operational (LOS)	N v f		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x)$ $x f_p$	N X <sup>1</sup> HV 1857	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	pc/h/ln
S	54.9	mph	x f <sub>p</sub> ) S		mnh
$D = v_p / S$	33.8	pc/mi/ln			mph
LOS	D		$D = v_p / S$ Required Number of Lanes	s, N	pc/mi/ln
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed			f
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>n</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		se free-flow	f <sub>p</sub> - Page 11-18	44.0	TRD - Page 11-11
speed DDHV - Directional design	hour volume		LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-∠,	

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	RA	MPS AND	RAMP JUN	CTIONS W	ORKSHE	EET			
General Info				Site Infor					
Analyst	AJR		Fr	eeway/Dir of Tr	avel	I-526 EB			
gency or Company				ınction		3140-EB On from	Rivers		
Date Performed		2014		ırisdiction					
nalysis Time Perio			Ar	nalysis Year		2018 Build - River	Center Site		
Project Description	Navy Base IC1	IF							
nputs		Francisco Nicon	har of Lanca N						
Jpstream Adj Ramp	)	1	ber of Lanes, N	2				Downstre	am Adj
□Yes □O	n	Ramp Number		1				Ramp	
_ res	11	Acceleration L	ane Length, L <sub>A</sub>	825				□Yes	On
✓ No 🗆 O	ff	Deceleration L	ane Length L <sub>D</sub>					✓ No	Off
		Freeway Volui	me, V <sub>F</sub>	3287				INO	
<sub>up</sub> = ft		Ramp Volume	, V <sub>R</sub>	476				L <sub>down</sub> =	ft
		1	-Flow Speed, S <sub>FF</sub>	55.0				.,	
$v_{\rm u} = {\rm veh/l}$	1	1	ow Speed, S <sub>FR</sub>	45.0				V <sub>D</sub> =	veh/h
Conversion	to nc/h lln		111	10.0					
				0/	0/ D	£	_	V/DII	
(pc/h)	(Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	f <sub>p</sub>	V = V/PH	F x f <sub>HV</sub> x f <sub>p</sub>
Freeway	3287	0.90	Level	17	0	0.922	1.00		3963
Ramp	476	0.90	Level	2	0	0.990	1.00		534
JpStream									
DownStream		Marria Araaa					Niverna Areas		
stimation o		Merge Areas			Fetimati	ion of v <sub>12</sub>	Diverge Areas		
.sumation o					LStillati				
	$V_{12} = V_{F}$						$V_R + (V_F - V_R)$		
EQ =	(Equ	ation 13-6 or	13-7)		L <sub>EQ</sub> =		(Equation 13-	-12 or 13-1	13)
P <sub>FM</sub> =	1.000	using Equat	ion (Exhibit 13-6)		P <sub>FD</sub> =	I	using Equation	on (Exhibit 1	3-7)
′ <sub>12</sub> =	3963	pc/h			V <sub>12</sub> =	1	oc/h		
or V <sub>av34</sub>	0 pc/	h (Equation 1	13-14 or 13-17)	)	$V_3$ or $V_{av34}$		pc/h (Equation '	13-14 or 13-	17)
$s V_3 \text{ or } V_{av34} > 2,7$	00 pc/h?	s 🗹 No				<sub>34</sub> > 2,700 pc/h? [	∃Yes □ No		
s V <sub>3</sub> or V <sub>av34</sub> > 1.5						<sub>34</sub> > 1.5 * V <sub>12</sub> /2			
Yes,V <sub>12a</sub> =			3-16, 13-18, or		If Yes,V <sub>12a</sub> =		oc/h (Equatio		3-18, or
	13-19)					1:	3-19)` '		
Capacity Ch					Capacity	y Checks			
	Actual	C	apacity	LOS F?	ļ.,,	Actual		pacity	LOS F?
					V <sub>F</sub>		Exhibit 13-		
$V_{FO}$	4497	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>	Exhibit 13-	8	
					V <sub>R</sub>		Exhibit 13	-	
		A				1	10		
low Enterin	Actual	7	<b>rea</b> Desirable	Violation?	Flow En	tering Dive	Max Des		Violation
	4497	Exhibit 13-8	4600:All	No	\/	Actual	Exhibit 13-8	lable	VIOIALIOIT
V <sub>R12</sub>				INO	V <sub>12</sub>	i Comico Do		n /if no	\
evel of Serv						Service De			( F)
D - 5 475		u.uu18 V <sub>12</sub> - U.U	10021 L <sub>A</sub>		1	$D_R = 4.252 + 0$	.υυσο ν <sub>12</sub> - 0	.009 L <sub>D</sub>	
D <sub>R</sub> = 5.475 -	• // \					c/mi/ln)			
) <sub>R</sub> = 35.1 (pc/r	•								
) <sub>R</sub> = 35.1 (pc/r	•				LOS = (E	xhibit 13-2)			
O <sub>R</sub> = 35.1 (pc/r	13-2)				_	exhibit 13-2) Determination	on		
os = 35.1 (pc/r OS = E (Exhibit	13-2) <b>mination</b>				Speed D		on		
$d_R = 35.1 \text{ (pc/r)}$ $d_R = 35.1 \text{ (pc/r)}$ $d_S = E \text{ (Exhibit)}$ $d_S = 0.597 \text{ (Exhibit)}$	t 13-2) <b>mination</b> tibit 13-11)				Speed D	Determination	on		
$R_{\rm R} = 35.1 \text{ (pc/r}$ $R_{\rm R} = 35.1 \text{ (pc/r}$	t 13-2)  mination tibit 13-11) (Exhibit 13-11)				Speed D D <sub>s</sub> = (E S <sub>R</sub> = mp	Determination xhibit 13-12) ph (Exhibit 13-12)	on		
$_{\rm R}$ = 35.1 (pc/r OS = E (Exhibit Speed Deternormal Speed D	t 13-2) <b>mination</b> tibit 13-11)				<b>Speed D</b> D <sub>s</sub> = (E S <sub>R</sub> = mp S <sub>0</sub> = mp	<b>Determinatio</b> xhibit 13-12)	on		

	RA	MPS AND	<b>RAMP JUNG</b>	CTIONS W	ORKSHE	ET			
General Int				Site Infor		· <del>-</del>			
Analyst	AJR		Fr	eeway/Dir of Tr		-526 EB			
Agency or Comp				nction		3140-EB On from	m Rivers		
Date Performed	7/25	5/2014	Ju	risdiction					
Analysis Time Pe	eriod PM I	Peak	Ar	alysis Year	2	2018 Build - Riv	er Center Site		
	on Navy Base IC	TF							
Inputs								ı	
Jpstream Adj Ra	amp	1 '	ber of Lanes, N	2				Downstrea	am Adj
	١٥	Ramp Numbe	r of Lanes, N	1				Ramp	
☐ Yes ☐	On	Acceleration L	ane Length, L <sub>A</sub>	825				□Yes	On
☑ No □	Off	Deceleration L	ane Length L <sub>D</sub>					✓No	_
		Freeway Volu	me, V <sub>F</sub>	3109				INO INO	Off
<sub>-up</sub> = ft		Ramp Volume	, V <sub>D</sub>	460				L <sub>down</sub> =	ft
			-Flow Speed, S <sub>FF</sub>	55.0					
$l_{\rm u}$ = ve	eh/h	1	ow Speed, S <sub>FR</sub>	45.0				$V_D =$	veh/h
Conversion	n to pc/h Un		* 110	+0.0					
	V V					1 .	1 .		
(pc/h)	(Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	f <sub>p</sub>	v = V/PHF	$x f_{HV} x f_{p}$
Freeway	3109	0.90	Level	15	0	0.930	1.00	3	714
Ramp	460	0.90	Level	2	0	0.990	1.00		516
UpStream									
DownStream									
= 4! = 4! =		Merge Areas			F - 4: 4:		Diverge Areas		
Estimation	or v <sub>12</sub>				Estimation				
	$V_{12} = V_{F}$	(P <sub>FM</sub> )				V <sub>12</sub> =	= V <sub>R</sub> + (V <sub>F</sub> - V	R)P <sub>FD</sub>	
- <sub>EQ</sub> =	(Equ	uation 13-6 or	13-7)		L <sub>EQ</sub> =		(Equation 13	3-12 or 13-1	3)
P <sub>FM</sub> =	1.000	using Equat	ion (Exhibit 13-6)		P <sub>FD</sub> =		using Equat	ion (Exhibit 13	3-7)
/ <sub>12</sub> =	3714	pc/h			V <sub>12</sub> =		pc/h		
/ <sub>3</sub> or V <sub>av34</sub>	0 pc/	h (Equation	13-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>		pc/h (Equation	13-14 or 13-1	7)
	2,700 pc/h?		,			> 2,700 pc/h?	Yes No		,
	1.5 * V <sub>12</sub> /2 □ Ye						Yes No		
			3-16, 13-18, or			1 12-	pc/h (Equati		3-18. or
f Yes,V <sub>12a</sub> =	13-19				If Yes,V <sub>12a</sub> =		13-19)		
Capacity C					Capacity	Checks			
	Actual	C	apacity	LOS F?		Actua		apacity	LOS F?
					V <sub>F</sub>		Exhibit 13	3-8	
$V_{FO}$	4230	Exhibit 13-8		No	$V_{FO} = V_{F}$	· V <sub>R</sub>	Exhibit 13	3-8	
					V <sub>R</sub>		Exhibit 1	3-	
	<u> </u>					<u> </u>	10		
	ring Merge II			Violetian	Flow Ent	<del>,                                      </del>	erge Influe Max De		\/iolotion(
-iow Enter	A a4a1	I IVIAX	Desirable	Violation?	V <sub>12</sub>	Actual		strable	Violation'
	Actual 4230		4600· VII		V 10	1	Exhibit 13-8	1	
V <sub>R12</sub>	4230	Exhibit 13-8	4600:All	INU		Country - D	-4-w11"	au /!E 4	<u></u>
V <sub>R12</sub> Level of Se	4230 ervice Deteri	Exhibit 13-8	if not F)	NO	Level of		eterminati	<u> </u>	F)
V <sub>R12</sub> Level of Se	4230 <b>ervice Deterr</b> 75 + 0.00734 v <sub>R</sub> +	Exhibit 13-8	if not F)	NO	Level of	) <sub>R</sub> = 4.252 +	<b>eterminati</b> 0.0086 V <sub>12</sub> -	<u> </u>	F)
$V_{R12}$ Level of Se $D_R = 5.47$ $D_R = 33.1 (p$	4230 <b>Prvice Deteri</b> 75 + 0.00734 v <sub>R</sub> + oc/mi/ln)	Exhibit 13-8	if not F)	NO	Level of  D <sub>R</sub> = (po	) <sub>R</sub> = 4.252 + c/mi/ln)		<u> </u>	F)
V <sub>R12</sub> Level of Se D <sub>R</sub> = 5.47 D <sub>R</sub> = 33.1 (p	4230 <b>Prvice Deteri</b> 75 + 0.00734 v <sub>R</sub> + oc/mi/ln) nibit 13-2)	Exhibit 13-8	if not F)	NO	Level of  D <sub>R</sub> = (po	) <sub>R</sub> = 4.252 +		<u> </u>	F)
V <sub>R12</sub> Level of Se D <sub>R</sub> = 5.47 D <sub>R</sub> = 33.1 (p	4230 <b>Prvice Deteri</b> 75 + 0.00734 v <sub>R</sub> + oc/mi/ln)	Exhibit 13-8	if not F)	NU	Level of  D <sub>R</sub> = (po	) <sub>R</sub> = 4.252 + c/mi/ln)	0.0086 V <sub>12</sub> -	<u> </u>	<i>F</i> )
V <sub>R12</sub> Level of Se D <sub>R</sub> = 5.47 D <sub>R</sub> = 33.1 (p .0S = D (Exh	4230 ervice Deterion 75 + 0.00734 v <sub>R</sub> + oc/mi/ln) nibit 13-2) ermination	Exhibit 13-8	if not F)	NU	Level of	o <sub>R</sub> = 4.252 + c/mi/ln) xhibit 13-2)	0.0086 V <sub>12</sub> -	<u> </u>	<i>F</i> )
$V_{R12}$ Level of Se $D_R = 5.47$ $D_R = 33.1 (properties)$ $D_R = 0.515 (properties)$	4230 Prvice Deternation 75 + 0.00734 v <sub>R</sub> + oc/mi/ln) nibit 13-2) Permination (Exibit 13-11)	Exhibit 13-8 <b>mination (</b> 10 0.0078 V <sub>12</sub> - 0.0	if not F)	NU	Level of   C	o <sub>R</sub> = 4.252 + c/mi/ln) xhibit 13-2) <b>eterminat</b>	0.0086 V <sub>12</sub> -	<u> </u>	<i>F</i> )
$V_{R12}$ Level of Se $D_R = 5.47$ $D_R = 33.1 \text{ (p. OS} = D \text{ (Exh. Speed Dete})}$ $M_S = 0.515  (B. S. S.$	4230 Pervice Deterior 75 + 0.00734 v <sub>R</sub> + oc/mi/ln) Poblibit 13-2) Permination (Exibit 13-11) Poph (Exhibit 13-11)	Exhibit 13-8 <b>mination (</b> 10 0.0078 V <sub>12</sub> - 0.0	if not F)	NU	$\begin{array}{c c} \textbf{Level of} \\ & \text{D}_{\text{R}} = & \text{(possion of the property)} \\ \text{LOS} = & \text{(Exsign of the property)} \\ \textbf{Speed D}_{\text{S}} = & \text{(Exsion of the property)} \\ \textbf{S}_{\text{R}} = & \text{mp} \end{array}$	D <sub>R</sub> = 4.252 + c/mi/ln)  xhibit 13-2) <b>eterminat</b> thibit 13-12)  h (Exhibit 13-12)	0.0086 V <sub>12</sub> - · ion	<u> </u>	<i>F</i> )
$V_{R12}$ Level of Se $D_R = 5.47$ $D_R = 33.1 \text{ (p}$ $0.0S = D \text{ (Exh}$ Speed Detection of Section 1.5	4230 Prvice Deternation 75 + 0.00734 v <sub>R</sub> + oc/mi/ln) nibit 13-2) Permination (Exibit 13-11)	Exhibit 13-8 <b>mination (</b> 1 0.0078 V <sub>12</sub> - 0.0	if not F)	NU	$\begin{array}{ccc} \textbf{Level of} \\ & & & \\ & & \\ & & \\ & \\ & \\ & \\ & \\ $	D <sub>R</sub> = 4.252 + c/mi/ln) xhibit 13-2) <b>eterminat</b> thibit 13-12)	0.0086 V <sub>12</sub> - 1	<u> </u>	<i>F</i> )

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	T	
General Information			Site Information		
Analyst Agency or Company Date Performed	AJR Atkins 7/25/2014		Highway/Direction of Trave From/To Jurisdiction	3150-R	B ivers to Rhett uild - River Center
Analysis Time Period	AM Peak		Analysis Year	Site	
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Pla	nning Data
Flow Inputs					
Volume, V AADT	3763	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 15	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R -$	1)] 0.930	
Speed Inputs			Calc Speed Adj and		
Lane Width		ft	<u> </u>		
Rt-Side Lat. Clearance		ft	f <sub>LW</sub>		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph		00.0	тірт
LOS and Performanc	e Measures	<u> </u>	Design (N)		
Operational (LOS) v <sub>p</sub> = (V or DDHV) / (PHF x l	N x f <sub>HV</sub> 2247	pc/h/ln	Design (N) Design LOS v <sub>p</sub> = (V or DDHV) / (PHF x	N x f <sub>HV</sub>	
x f <sub>p</sub> )		·	x f <sub>p</sub> )	110	pc/h/ln
S D = / C	52.4	mph	S P		mph
$D = v_p / S$	42.9	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	E		Required Number of Lane	s, N	
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed DDHV - Directional design	BFFS - Ba		E <sub>R</sub> - Exhibits 11-10, 11-12 E <sub>T</sub> - Exhibits 11-10, 11-11 f <sub>p</sub> - Page 11-18 LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	, 11-13	f <sub>LW</sub> - Exhibit 11-6 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed	AJR Atkins 7/25/2014		Highway/Direction of Trave From/To Jurisdiction	3150-Ri	B ivers to Rhett uild - River Center
Analysis Time Period	PM Peak		Analysis Year	Site	ilia - River Ceriler
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			es.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	3569	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 14	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1)] 0.935	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f <sub>LW</sub>		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			·
LOS and Performanc	e Measures	6	Design (N)		
Operational (LOS) v <sub>p</sub> = (V or DDHV) / (PHF x I	N x f <sub>HV</sub> 2122	pc/h/ln	Design (N) Design LOS v <sub>p</sub> = (V or DDHV) / (PHF x	N x f <sub>HV</sub>	n a /h // n
x f <sub>p</sub> ) S	55.1	mnh	x f <sub>p</sub> )		pc/h/ln
S D = v <sub>p</sub> / S	38.5	mph pc/mi/ln	S		mph
LOS	E	ролили	D = v <sub>p</sub> / S Required Number of Lane	e N	pc/mi/ln
Glossany			Factor Location	J, 14	
Glossary	0 0:-	- al	actor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate		sity e-flow speed	E <sub>R</sub> - Exhibits 11-10, 11-12 E <sub>T</sub> - Exhibits 11-10, 11-11, f <sub>n</sub> - Page 11-18		f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1
LOS - Level of service speed DDHV - Directional design		ase free-flow	LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	J

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		RAMP	S AND RAM	IP JUNCTI	ONS WO	RKS	HEET			
General Infor	mation	TO UNI	<u> </u>	Site Infor						
Analyst Agency or Company	AJR	s		reeway/Dir of Tr	avel	I-526 E 3160-E	B B Off to Rh	ett		
Date Performed	7/25/	2014	J	urisdiction						
Analysis Time Perio			Α	nalysis Year		2018 B	uild - River	Center Site		
Project Description	Navy Base ICT	F								
Inputs		1								
Upstream Adj F	Ramp	Freeway Num Ramp Numbe	ber of Lanes, N r of Lanes, N	2 1					Downstrea Ramp	m Adj
□Yes	□On	1	ane Length, L <sub>A</sub>	205					Yes	On
✓ No	Off	1	ane Length L <sub>D</sub>	225					✓ No	Off
	<u>.</u>	Freeway Volu		3763				l,	=	ft
L <sub>up</sub> = 1	Tr K						_ <sub>down</sub> =	10		
V,, = v	eh/h		-Flow Speed, S <sub>FF</sub>	60.0				<u> </u>	V <sub>D</sub> =	veh/h
u v	CIIIII	Ramp Free-Fl	ow Speed, $S_{FR}$	45.0					D	
Conversion t	o pc/h Und	der Base	Conditions							
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	f <sub>p</sub>	/ = V/PHF :	x f <sub>HV</sub> x f <sub>p</sub>
Freeway	3763	0.90	Level	15	0	0.	930	1.00	449	95
Ramp	483 0.90 Level 7 0 0.966 1.00						1.00	55	5	
UpStream		$\sqcup$				_				
DownStream		Marra Arasa			-			diverse Asses		
Estimation of		Merge Areas			Estimati	ion o		iverge Areas		
Estimation of	12				LSumau					
	$V_{12} = V_{F}$	(P <sub>FM</sub> )					V <sub>12</sub> =	$V_R + (V_F - V_R)$	)P <sub>FD</sub>	
L <sub>EQ</sub> =	(Equa	tion 13-6 or	13-7)		L <sub>EQ</sub> =		(1	Equation 13-12	2 or 13-13)	
P <sub>FM</sub> =	using	Equation (	Exhibit 13-6)		P <sub>FD</sub> =		1.0	000 using Equ	ation (Exhib	it 13-7)
V <sub>12</sub> =	pc/h				V <sub>12</sub> =		44	95 pc/h		
V <sub>3</sub> or V <sub>av34</sub>	pc/h (	Equation 13	-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>		0	pc/h (Equation	n 13-14 or	13-17)
Is $V_3$ or $V_{av34} > 2,70$	00 pc/h?	s 🗌 No				<sub>84</sub> > 2,7	00 pc/h? [	Yes ☑ No		
Is V <sub>3</sub> or V <sub>av34</sub> > 1.5	* V <sub>12</sub> /2  Yes	s 🗆 No			Is V <sub>3</sub> or V <sub>av3</sub>	<sub>34</sub> > 1.5	* V <sub>12</sub> /2	Yes ☑ No		
If Yes,V <sub>12a</sub> =	pc/h (	Equation 13	-16, 13-18, or		If Yes,V <sub>12a</sub> =	-		c/h (Equation	13-16, 13-	18, or 13-
	13-19)				1		19	9)		
Capacity Che	ecks			V.	Capacity	y Ch	ecks			
	Actual	C	apacity	LOS F?			Actual		pacity	LOS F?
					V <sub>F</sub>		4495	Exhibit 13-8	4600	No
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$	- V <sub>R</sub>	3940	Exhibit 13-8	4600	No
					$V_R$		555	Exhibit 13-10	2100	No
Flow Enterin	a Merae In	fluence A	rea		Flow En	terin	a Divei	ge Influenc	e Area	
	Actual		Desirable	Violation?	1 10 11 = 11	_	Actual	Max Desirabl		Violation?
V <sub>R12</sub>		Exhibit 13-8			V <sub>12</sub>	$\overline{}$	495	Exhibit 13-8	4400:All	Yes
Level of Serv	rice Detern		if not F)	1				termination		
$D_R = 5.475 + 0$								.0086 V <sub>12</sub> - 0.0	•	,
	• • •	12	5.000 <b>2</b> , L <sub>A</sub>		1			12 0.0	-D	
D <sub>R</sub> = (pc/mi/lr	•				l		/mi/ln)			
LOS = (Exhibit							oit 13-2)			
Speed Deteri	mination				Speed D					
M <sub>S</sub> = (Exibit 1	3-11)				1 *	348 (E	xhibit 13-	12)		
	nibit 13-11)				$S_R = 53$	3.7 mph	(Exhibit	13-12)		
	nibit 13-11)				S <sub>0</sub> = N/A mph (Exhibit 13-12)					
	nibit 13-13)				S = 53	3.7 mph	(Exhibit	13-13)		
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	RAMP	S AND RAM	P JUNCTI	ONS WO	RKS	HEET					
General Information			Site Infor								
Analyst AJR		Fr	eeway/Dir of Tr	avel	I-526 E	:B					
Agency or Company Atkir	าร		ınction		3160-E	B Off to R	hett				
	/2014		ırisdiction								
	Peak	Ar	nalysis Year		2018 B	uild - Rive	Center Site				
Project Description Navy Base IC	IF.										
Inputs	Erooway Nun	nber of Lanes, N	2								
Upstream Adj Ramp	1 '							Downstrea	am Adj		
☐Yes ☐On	1 '	er of Lanes, N	1					Ramp			
_ 100011	1	Lane Length, L <sub>A</sub>						☐Yes	On		
✓ No ☐ Off	1	Lane Length L <sub>D</sub>	225					☑ No	Off		
	Freeway Volu	ıme, V <sub>F</sub>	3569								
L <sub>up</sub> = ft	Ramp Volum	e, V <sub>R</sub>	703	703 L <sub>down</sub> =					ft		
V/ =	Freeway Free	e-Flow Speed, S <sub>FF</sub>	60.0					V <sub>D</sub> =	veh/h		
$V_u = veh/h$	Ramp Free-F	low Speed, S <sub>FR</sub>	45.0					l'D	VCII/II		
Conversion to pc/h Un	der Base	Conditions									
(pc/h) V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	f <sub>p</sub>	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>		
Freeway 3569	0.90	Level	14	0	0.	935	1.00	42	43		
Ramp 703	0.90	Level	4	0	0.	980	1.00	7:	97		
UpStream											
DownStream											
	Merge Areas			Estimat	lion o	. <b></b>	Diverge Areas				
Estimation of v <sub>12</sub>				EStillat	1011 0						
$V_{12} = V_{F}$							: V <sub>R</sub> + (V <sub>F</sub> - V				
<sub>-EQ</sub> = (Equa	ation 13-6 or	13-7)		L <sub>EQ</sub> =		(	Equation 13-	12 or 13-13	)		
<sub>FM</sub> = using	Equation (	Exhibit 13-6)		P <sub>FD</sub> =		1.	000 using Eq	uation (Exhi	bit 13-7)		
$V_{12} = pc/h$				V <sub>12</sub> =		42	243 pc/h				
$V_3$ or $V_{av34}$ pc/h	(Equation 13	3-14 or 13-17)		$V_3$ or $V_{av34}$		0	pc/h (Equation	on 13-14 oı	13-17)		
Is $V_3$ or $V_{av34} > 2,700$ pc/h? $V_{e}$	s 🗌 No			Is V <sub>3</sub> or V <sub>av</sub>	, <sub>34</sub> > 2,7	00 pc/h? [	☐Yes ☑ No				
Is $V_3$ or $V_{av34} > 1.5 * V_{12}/2 \square Ye$	s 🗌 No			Is V <sub>3</sub> or V <sub>av</sub>	, <sub>34</sub> > 1.5	* V <sub>12</sub> /2	☐Yes ☑ No				
$f V_{oc} V = pc/h$	(Equation 13	3-16, 13-18, or		If Yes,V <sub>12a</sub> =	=	p	c/h (Equation	13-16, 13	-18, or 13-		
10 10	)						9)				
Capacity Checks	1 /	Dan a alle :	1 100 50	Capacit	y Cn		1 0		1,00,5		
Actual	+ '	Capacity	LOS F?	V <sub>F</sub>		Actual	Exhibit 13-	apacity 8 4600	LOS F		
V						4243		_	No		
V <sub>FO</sub>	Exhibit 13-8			$V_{FO} = V_{F}$		3446	Exhibit 13-	_	No		
				V <sub>R</sub>		797	Exhibit 13-1		No		
Flow Entering Merge In			V' de Caro	Flow En	_	<del></del>	rge Influen		1 Artara		
Actual		Desirable	Violation?			Actual	Max Desira		Violation		
V <sub>R12</sub>	Exhibit 13-8			V <sub>12</sub>		1243	Exhibit 13-8	4400:All	No No		
Level of Service Deteri							terminatio		F)		
$D_R = 5.475 + 0.00734 v_R +$	0.0078 V <sub>12</sub>	- 0.00627 L <sub>A</sub>		1			.0086 V <sub>12</sub> - 0	.009 L <sub>D</sub>			
$D_R = (pc/mi/ln)$				l .,		/mi/ln)					
_OS = (Exhibit 13-2)				-	<u> </u>	oit 13-2)					
Speed Determination				Speed L	Deter	minatio	on				
M <sub>S</sub> = (Exibit 13-11)				1 "	.370 (E	xhibit 13	-12)				
						(Exhibit	13-12)				
$S_R$ = mph (Exhibit 13-11)						-	*				
S <sub>R</sub> = mph (Exhibit 13-11)				$S_0 = N$	/A mph	-	13-12)				

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	3165 - F On	Rhett Off to Rhett
Date Performed	7/25/2014		Jurisdiction	On	
Analysis Time Period	AM Peak		Analysis Year	2018 Βι Site	ıild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	3280	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 15	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length	Level mi	
Oala lata Ela Aulia	1 1 -		Up/Down %		
Calculate Flow Adjus					
f <sub>p</sub>	1.00		$E_R$	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] 0.930	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		$f_{LC}$		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			•
LOS and Performanc	e Measures	3	Design (N)		
0			Design (N)		
Operational (LOS)	NI v. £		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x)$ $x f_p$	1959	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	pc/h/ln
S	57.7	mph	x f <sub>p</sub> )		
$D = v_p / S$	34.0	pc/mi/ln	S D = · · / C		mph
LOS	D		$D = v_p / S$ Required Number of Lanes	s N	pc/mi/ln
 Glossary			Factor Location	, . <del>.</del>	
N - Number of lanes	S - Spee	- <sub>7</sub> 4			
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>p</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18		TRD - Page 11-1
speed			LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	
DDHV - Directional design	hour volume		11-3		

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	3165 - F On	Rhett Off to Rhett
Date Performed	7/25/2014		Jurisdiction	On	
Analysis Time Period	PM Peak		Analysis Year	2018 Bu Site	ıild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	☐ Plar	nning Data
Flow Inputs					
Volume, V AADT	2866	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 14	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length	Level mi	
Coloulata Flour Adius	tmonto		Up/Down %		
Calculate Flow Adjus					
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$		
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		$f_{LC}$		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performanc	e Measures	3	Design (N)		
			Design (N)		
Operational (LOS)	NI 6		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x)$	N X <sup>†</sup> HV 1704	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	
x f <sub>p</sub> )			x f <sub>p</sub> )	110	pc/h/ln
S	59.8	mph	S		mph
$D = v_p / S$	28.5	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	D		Required Number of Lanes	s, N	·
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed			f = Evb:bit 44 0
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>p</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		se free-flow	f <sub>p</sub> - Page 11-18	44.0	TRD - Page 11-1
speed			LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	
DDHV - Directional design	hour volume		11-3		

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Navy Base ICTF

			REEWAY	/ WEAV	NG WOF	RKSHEE	<u>T</u>				
General	Informati	on			Site Info	rmation					
Date Perfori Analysis Tin	gency/Company Atkins ate Performed 7/25/2014 nalysis Time Period AM Peak roject Description Navy Base ICTF					Freeway/Dir of Travel I-526 EB Weaving Segment Location 3170 - Rhett to Virginia Analysis Year 2018 Build - River Center Site					
Inputs					_						
Weaving se Freeway fre	mber of lanes, N gment length, L <sub>o</sub> e-flow speed, Fl	s FS		1090ft 60 mph	Segment typ Freeway min Freeway max Terrain type	imum speed			Freewa 1 230 Leve		
Conver	sions to po	c/h Unde	r Base Co	ndition	<u> </u>	1					
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	f <sub>HV</sub>	fp	v (pc/h)		
$V_{FF}$	2815	0.90	14	0	1.5	1.2	0.935	1.00	3347		
$V_{RF}$	1135	0.90	14	0	1.5	1.2	0.935	1.00	1349		
V <sub>FR</sub>	465	0.90	14	0	1.5	1.2	0.935	1.00	553		
$V_{RR}$	188	0.90	11	0	1.5	1.2	0.948	1.00	220		
V <sub>NW</sub>	3567		•	•			•	V =	5469		
V <sub>W</sub>	1902										
VR	0.348										
Configu	ration Cha	aracteris	tics								
Minimum m	aneuver lanes, l	$N_{WL}$		2 lc	Minimum we	eaving lane cl	hanges, LC <sub>MIN</sub>		1902 lc/h		
Interchange	density, ID			0.7 int/mi	Weaving lan	e changes, L	.C <sub>w</sub>		2053 lc/h		
Minimum R	F lane changes,	, LC <sub>RF</sub>		1 lc/pc	Non-weaving	g lane chang	es, LC <sub>NW</sub>		748 lc/h		
Minimum Fl	R lane changes,	, LC <sub>FR</sub>		1 lc/pc	Total lane ch	nanges, LC <sub>AL</sub>	L		2801 lc/h		
Minimum R	R lane changes	, LC <sub>RR</sub>		lc/pc	, ==						
Weavin	g Segment	t Speed,	Density, I	_evel of	Service,	and Cap	acity				
Weaving se	gment flow rate	, V		5469 pc/h	_ ~	ensity factor,			0.476		
Weaving se	gment capacity,	, c <sub>w</sub>		5375 veh/h							
Weaving se	gment v/c ratio			0.951	Average wearing and C						
_	gment density, I	D	4		Average non		1444		37.6 mph		
Level of Se	rvice, LOS			E	Maximum we	eaving length	n, L <sub>MAX</sub>		6102 f		
Notes											
Chapter 13, "	egments longer to Freeway Merge a es that exceed the	and Diverge Se	gments".			solated merge	and diverge ar	eas using the	procedures of		

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Navy Base ICTF

			REEWA	/ WEAV			Γ			
General	Information	on			Site Info	rmation				
Analyst Agency/Con Date Perforr Analysis Tim	med	AJR Atkins 7/25/20 PM Pe			Weaving Seg	Freeway/Dir of Travel I-526 EB Weaving Segment Location 3170 - Rhett to Virginia Analysis Year 2018 Build - River Center Site				
Project Desc <b>Inputs</b>	cription Navy Ba	ase ICTF								
Weaving con Weaving nun Weaving se Freeway free	mber of lanes, N gment length, L <sub>s</sub> e-flow speed, FF	S FS		One-Sided 3 1090ft 60 mph	Segment typ Freeway min Freeway max Terrain type	Freewa 1 230 Leve				
Convers	sions to po	ı	1	1	1		<u> </u>		1	
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	f <sub>HV</sub>	fp	v (pc/h)	
V <sub>FF</sub>	2730	0.90	13	0	1.5	1.2	0.939	1.00	3231	
$V_{RF}$	977	0.90	13	0	1.5	1.2	0.939	1.00	1156	
V <sub>FR</sub>	136	0.90	33	0	1.5	1.2	0.858	1.00	176	
$V_{RR}$	49	0.90	33	0	1.5	1.2	0.858	1.00	63	
$V_{NW}$	3294							V =	4626	
V <sub>W</sub>	1332									
VR	0.288									
	ration Cha		tics		1					
Minimum m	aneuver lanes, I	$N_{WL}$		2 lc	Minimum we	1332 lc/h				
Interchange	•			0.7 int/mi	"					
	F lane changes,	Tu		1 lc/pc	Non-weaving	-	****		692 lc/h	
	R lane changes,	111		1 lc/pc	Total lane ch	nanges, LC <sub>AL</sub>	L		2175 lc/h	
Minimum RI	R lane changes,	LC <sub>RR</sub>		lc/pc	Non-weaving	g vehicle inde	ex, I <sub>NW</sub>		251	
Weaving	g Segment	Speed,	Density,	Level of	1					
J	gment flow rate,			4626 pc/h	Weaving inte	•			0.390	
Weaving segment capacity, c <sub>w</sub> 5538 ve					Weaving seg				44.2 mph 47.4 mph	
Weaving segment v/c ratio 0.78 Weaving segment density, D 34.9 pc/mi/					'   "					
Weaving se Level of Ser	•	J	34	4.9 pc/mi/ln D	1		****		43.0 mph	
	VIOE, LOO			U	Maximum we	eaving lengtr	I, L <sub>MAX</sub>		5455 f	
Chapter 13, "	egments longer the Freeway Merge a es that exceed the	ind Diverge Se	egments".	· ·		olated merge	and diverge are	eas using the	procedures of	

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>I-526 El</i>	 B
Agency or Company	Atkins		From/To	3180-Vi	rginia to
Date Performed	7/25/2014		Jurisdiction	Clemen	isremy
Analysis Time Period	AM Peak		Analysis Year	2018 Βι Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	□Plar	nning Data
Flow Inputs					
Volume, V AADT	3950	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 12	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$		
Speed Inputs	1.0		Calc Speed Adj and		
Lane Width		ft	Caic Speed Auj and	113	
Rt-Side Lat. Clearance		ft			
Number of Lanes, N	2	11	f <sub>LW</sub>		mph
Total Ramp Density, TRD	_	ramps/mi	f <sub>LC</sub>		mph
FFS (measured)	60.0	•	TRD Adjustment		mph
Base free-flow Speed,	00.0	mph	FFS	60.0	mph
BFFS		mph			
LOS and Performanc	e Measures	3	Design (N)		
Operational (LOS)			Design (N) Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub> 2326	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	Nyf	
x f <sub>p</sub> )	2020	релипп	$x f_p$	HV 'HV	pc/h/ln
S	50.4	mph	S S		mph
D = v <sub>p</sub> / S	46.1	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	F		Required Number of Lane	s, N	релипи
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed			f Fubibit 44.0
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>n</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	, 11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18 LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2	TRD - Page 11-11
speed DDHV - Directional design	hour volume		11-3	1 I- <b>∠</b> ,	
			<u>.</u>		

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	3180-Vi Clemen	irginia to tsFerry
Date Performed	7/25/2014		Jurisdiction	Ciemen	isi erry
Analysis Time Period	PM Peak		Analysis Year	2018 Bu Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			es.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	3707	veh/h	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 12	
		veh/day	'		
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D			%RVs, P <sub>R</sub> General Terrain:	0 Level	
DDHV = AADT x K x D		veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjus	stments				
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1)] 0.943	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph		00.0	трп
LOS and Performanc	e Measures	 S	Design (N)		
			Design (N)		
Operational (LOS)			Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV 2183</sub>	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f	
x f <sub>p</sub> )	2700	p 6/1////	$x f_p$	HV	pc/h/ln
S	53.8	mph	S S		mph
$D = v_p / S$	40.6	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	E		Required Number of Lanes	s. N	ролиши
Glossary			Factor Location	,	
N - Number of lanes	S - Spee	ed			£ FULLBRAAC
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>n</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	, 11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18	44.0	TRD - Page 11-1
speed			LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	
DDHV - Directional design	hour volume		11-3		

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		RAMP	S AND RAM	IP JUNCTI	ONS WC	RKS	HEET					
General In	formation			Site Infor								
Analyst	AJR		F	reeway/Dir of Tr	avel	I-526 E	EB					
Agency or Comp	-	IS		unction		3190-E	EB Off to CI	ementsFerrySB				
Date Performed		/2014	-	urisdiction								
Analysis Time P			A	nalysis Year		2018 E	Build - Rive	Center Site				
Project Descripti <b>Inputs</b>	ion Navy Base IC	l F										
•		Erooway Nur	nber of Lanes, N	2								
Upstream A	Adj Ramp	Ramp Number							Downstrea	ım Adj		
□Yes	On	I '	•	1					Ramp			
		1	Lane Length, L <sub>A</sub>						□Yes	On		
✓ No									✓No	Off		
	_	Freeway Volume, V <sub>F</sub> 3950								ft		
L <sub>up</sub> =	ft	Ramp Volume	11	366					L <sub>down</sub> =	IL		
V <sub>u</sub> =	veh/h		e-Flow Speed, S <sub>FF</sub>	60.0					V <sub>D</sub> =	veh/h		
<b>*</b> u	VCII/II	Ramp Free-F	low Speed, S <sub>FR</sub>	45.0								
Conversio	n to pc/h Un	der Base	Conditions									
(pc/h) V PHF Terrain				%Truck	%Rv		$f_{HV}$	f <sub>p</sub>	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>		
Freeway	3950	0.90	Level	12	0	0	.943	1.00	46	52		
Ramp	366	0.90	Level	8	0	0	.962	1.00	42	23		
UpStream						_						
DownStream		Marga Arasa					-	 Diverge Areas				
Merge Areas  Estimation of v <sub>12</sub>						ion o	of v <sub>12</sub>	Diverge Areas				
		/ D \						- \ /   (\ / \ /	\D			
$V_{12} = V_F (P_{FM})$								V <sub>R</sub> + (V <sub>F</sub> - V				
-EQ =		ation 13-6 or			L <sub>EQ</sub> =			Equation 13-				
P <sub>FM</sub> =	_	Equation (	EXNIDIT 13-6)		P <sub>FD</sub> =			000 using Eq	uation (Exhi	oit 13-7)		
/ <sub>12</sub> =	pc/h				V <sub>12</sub> =			652 pc/h				
V <sub>3</sub> or V <sub>av34</sub>			3-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>			pc/h (Equation	on 13-14 or	13-17)		
	2,700 pc/h? ☐ Ye					•		☐ Yes ☑ No				
	1.5 * V <sub>12</sub> /2		10 10 10					☐Yes ☑ No	10 10 10	10 10		
f Yes,V <sub>12a</sub> =	pc/n ( 13-19)		3-16, 13-18, or		If Yes,V <sub>12a</sub> =	=		oc/h (Equation 9)	1 13-16, 13-	18, Of 13-		
Capacity C	-	,			Capacit	y Ch		- /				
	Actual		Capacity	LOS F?			Actual	Ca	apacity	LOS F		
					V <sub>F</sub>		4652	Exhibit 13-	8 4600	Yes		
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$	- V <sub>R</sub>	4229	Exhibit 13-	8 4600	No		
					V <sub>R</sub>		423	Exhibit 13-1	0 2100	No		
Flow Enter	ring Merge In	fluence A	\rea				na Dive	rge Influen	ce Area			
1011 =11101	Actual		Desirable	Violation?		_	Actual	Max Desira		Violation <sup>6</sup>		
V <sub>R12</sub>		Exhibit 13-8			V <sub>12</sub>	$\neg$	4652	Exhibit 13-8	4400:All	Yes		
	ervice Detern		if not F)			f Ser	vice De	terminatio				
	+ 0.00734 v <sub>R</sub> +				+			.0086 V <sub>12</sub> - 0.		,		
O <sub>R</sub> = (pc/n	• • • • • • • • • • • • • • • • • • • •	12	A		L		:/mi/ln)	12	U			
	ibit 13-2)				1		bit 13-2)					
	ermination				Speed L	•						
					<del>  '                                   </del>							
•	oit 13-11)				$D_s = 0.336$ (Exhibit 13-12) $S_R = 54.0$ mph (Exhibit 13-12)							
	Exhibit 13-11)											
	Exhibit 13-11)				S <sub>0</sub> = N/A mph (Exhibit 13-12)							
• ' '	,						S = 54.0 mph (Exhibit 13-13)					
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	RAMP	S AND RAM	IP JUNCTI	ONS WO	RKS	HEET			
General Information			Site Infor						
Analyst AJR		Fr	reeway/Dir of Tr	avel	I-526 E	В			
Agency or Company Atkir	าร		unction		3190-E	B Off to C	lementsFerrySB		
	/2014		urisdiction						
	Peak	IA.	nalysis Year		2018 B	uild - Rive	r Center Site		
Project Description Navy Base IC Inputs	IF.								
•	Freeway Nun	nber of Lanes, N	2						
Upstream Adj Ramp	1 '	er of Lanes, N	1					Downstrea Ramp	am Adj
□Yes □On	1 '	•	I					Kamp	
	1	Lane Length, L <sub>A</sub>	050					Yes	On
✓ No ☐ Off	1	Lane Length L <sub>D</sub>	250					✓ No	Off
L <sub>up</sub> = ft	Freeway Volu		3707					L <sub>down</sub> =	ft
L <sub>up</sub> = ft	Ramp Volum	13	190					_down	
V <sub>u</sub> = veh/h		e-Flow Speed, S <sub>FF</sub>	60.0					V <sub>D</sub> =	veh/h
		low Speed, S <sub>FR</sub>	45.0						
Conversion to pc/h Un	der Base	Conditions		1				1	
(pc/h) V (Veh/hr)	%Truck	%Rv		f <sub>HV</sub>	f <sub>p</sub>	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>		
Freeway 3707	0.90	Level	12	0	0.	943	1.00	43	866
Ramp 190	0.90	Level	13	0	0.	939	1.00	2:	25
UpStream					_				
DownStream	Merge Areas						L Diverge Areas		
Estimation of v <sub>12</sub>	merge Areas			Estimat	tion o	$fv_{12}$	Siverge Areas		
V <sub>12</sub> = V <sub>F</sub>	(P)						= V <sub>R</sub> + (V <sub>F</sub> - V	' \P	
	ation 13-6 or	· 13_7)		=			Equation 13-		)
	Equation (			L <sub>EQ</sub> =			-		
$P_{\text{FM}} = $ using $V_{12} = $ pc/h	Lquation (	EXHIBIT 13-0)		P <sub>FD</sub> = V <sub>12</sub> =			000 using Ed	uation (Exil	DIL 13-1)
	/Equation 13	) 14 or 12 17)					366 pc/h	on 12 11 o	. 10 17)
Is $V_3$ or $V_{av34}$ > 2,700 pc/h? $\square$ Ye		3-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>	> 2.7		pc/h (Equati ☐Yes ☑ No	011 13-14 01	13-17)
Is $V_3$ or $V_{av34} > 2.7700$ pc/ii: $V_4$				u			⊒ Yes ⊻ No ⊒Yes ⊻ No		
		3-16, 13-18, or					⊒ Yes 🛂 No oc/h (Equatior	13-16 13	-18 or 13.
f Yes,V <sub>12a</sub> = pc/n ( 13-19		j-10, 15-10, 0i		If Yes,V <sub>12a</sub> =	=		9)	1 10-10, 10	-10, 01 10
Capacity Checks				Capacit	y Ch	ecks			
Actual	(	Capacity	LOS F?			Actual		apacity	LOS F
				V <sub>F</sub>		4366	Exhibit 13-	8 4600	No
V <sub>FO</sub>	Exhibit 13-8			$V_{FO} = V_{F}$	- V <sub>R</sub>	4141	Exhibit 13-	8 4600	No
				$V_R$		225	Exhibit 13-	10 2100	No
Flow Entering Merge In	nfluence A	Area		Flow Er	nterin	g Dive	rge Influer		
Actual	Max	Desirable	Violation?			Actual	Max Desira	ble	Violation
V <sub>R12</sub>	Exhibit 13-8			V <sub>12</sub>		1366	Exhibit 13-8	4400:All	No
Level of Service Deteri	mination (	if not F)		-			terminatio		F)
$D_R = 5.475 + 0.00734 v_R +$			$D_R = 4$	.252 + 0	.0086 V <sub>12</sub> - 0	.009 L <sub>D</sub>			
$O_R = (pc/mi/ln)$				$D_R = 39$	9.5 (pc	/mi/ln)			
OS = (Exhibit 13-2)				LOS = E	(Exhil	oit 13-2)			
Speed Determination				Speed L	Deter	minatio	on		
				$D_s = 0$	.318 (E	xhibit 13	-12)		
$M_{\rm s}$ = (Exibit 13-11)				S <sub>R</sub> = 54.3 mph (Exhibit 13-12)					
$M_S = $ (Exibit 13-11) $S_D = $ mph (Exhibit 13-11)				$S_R = 54$	4.3 mph	(Exhibit	13-12)		
$S_R$ = mph (Exhibit 13-11)					-	(Exhibit (Exhibit	-		
				$S_0 = N$	I/A mph		13-12)		

		RAMP	S AND RAN	IP JUNCTI	ONS WC	ORKS	HEET			
General In:	formation			Site Infor						
Analyst	AJR		F	reeway/Dir of Tr	avel	I-526 E	ΞB			
Agency or Comp				unction		3200-E	EB Off to C	ementsFerryNB		
Date Performed		/2014	-	urisdiction						
Analysis Time Pe			A	nalysis Year		2018 E	Build - Rive	r Center Site		
	on Navy Base IC	l F								
Inputs		Eroowov Nun	nber of Lanes, N	2					1	
Upstream A	idj Ramp	1 1							Downstrea	ım Adj
□Yes	□On	Ramp Numbe	•	1					Ramp	
□ 163		1	Lane Length, L <sub>A</sub>						□Yes	On
✓ No							✓No	Off		
		Freeway Volu	ıme, V <sub>F</sub>	3584						
L <sub>up</sub> =	ft	Ramp Volume	e, V <sub>R</sub>	872					L <sub>down</sub> =	ft
		Freeway Free	e-Flow Speed, S <sub>FF</sub>	60.0					V <sub>D</sub> =	veh/h
$V_u =$	veh/h	Ramp Free-F	low Speed, S <sub>ER</sub>	25.0					V <sub>D</sub> –	ven/m
Conversio	n to pc/h Un	der Base	Conditions							
(pc/h)	%Truck	%Rv		f <sub>HV</sub>	f <sub>p</sub>	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>			
Freeway	(Veh/hr) 3584	0.90	Level	12	0	0	.943	1.00	42	21
Ramp	872	0.90	Level	21	0	0	.905	1.00	10	71
UpStream										
DownStream		Merge Areas								
			Cotino o	· · · · ·	<u> </u>	Diverge Areas				
Estimation	1 of V <sub>12</sub>				Estimat	tion c				
$V_{12} = V_F (P_{FM})$							V <sub>12</sub> =	V <sub>R</sub> + (V <sub>F</sub> - V	$_{R})P_{FD}$	
- <sub>EQ</sub> =	(Equa	ation 13-6 or	13-7)		L <sub>EQ</sub> =		(	Equation 13-1	12 or 13-13	)
P <sub>FM</sub> =	using	Equation (	Exhibit 13-6)		P <sub>FD</sub> =		1.	000 using Eq	uation (Exhi	bit 13-7)
/ <sub>12</sub> =	pc/h				V <sub>12</sub> =		42	221 pc/h		
$V_3$ or $V_{av34}$	pc/h (	Equation 13	3-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>		0	pc/h (Equation	on 13-14 or	13-17)
	2,700 pc/h? ☐ Ye	s 🗌 No			Is V <sub>3</sub> or V <sub>a</sub>	<sub>/34</sub> > 2,7	700 pc/h? [	☐Yes ☑ No		
	1.5 * V <sub>12</sub> /2 ☐ Ye							☐Yes ☑ No		
f Yes,V <sub>12a</sub> =			3-16, 13-18, or		If Yes,V <sub>12a</sub>			c/h (Equation	13-16, 13-	18, or 13
	13-19	)					1	9)		
Capacity C	1				Capacit	ty Ch	ı'			
	Actual		Capacity	LOS F?			Actual		apacity	LOS F
					V <sub>F</sub>		4221	Exhibit 13-		No
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$	- V <sub>R</sub>	3150	Exhibit 13-	8 4600	No
					V <sub>R</sub>		1071	Exhibit 13-1	0 1900	No
Flow Enter	ring Merge In	fluence A	\rea		Flow Er	nterir	ng Dive	rge Influen		
	Actual	Max	Desirable	Violation?			Actual	Max Desiral	ble	Violation
$V_{R12}$		Exhibit 13-8			V <sub>12</sub>		4221	Exhibit 13-8	4400:All	No
Level of Se	ervice Deterr	nination (	if not F)		Level o	f Ser	vice De	terminatio	n (if not l	F)
$D_R = 5.475$			$D_R = 4$	4.252 + 0	.0086 V <sub>12</sub> - 0.	.009 L <sub>D</sub>				
$D_R = (pc/m)$	ni/ln)	· <del>-</del>			L		:/mi/ln)			
	ibit 13-2)						bit 13-2)			
` .	ermination				Speed I			on		
	•						xhibit 13			
	Exhibit 13-11)				$D_s = 0.654$ (Exhibit 13-12) $S_R = 48.2$ mph (Exhibit 13-12)					
	· · · · · · · · · · · · · · · · · · ·				$S_0$ = N/A mph (Exhibit 13-12)					
	Exhibit 13-11)				S = 48.2 mph (Exhibit 13-13)					
, ,	Exhibit 13-13)				L		,			10011
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		RAMP	S AND RAM	IP JUNCTI	ONS WO	RKS	HEET				
General Info	rmation			Site Infor		- 13	· •				
Analyst Agency or Company	AJR	s		reeway/Dir of Tr	avel	I-526 E 3200-E		ementsFerryNB			
Date Performed	7/25/			urisdiction	•						
Analysis Time Perio	d PM P	eak eak	А	nalysis Year		2018 B	uild - River	Center Site			
Project Description	Navy Base ICT	F									
Inputs											
Upstream Adj F	Ramp	Freeway Num Ramp Numbe	ber of Lanes, N r of Lanes. N	2					Downstrea Ramp	m Adj	
□Yes	□On	Acceleration L	ane Length, L <sub>A</sub>						□Yes	On	
✓ No	Off							✓ No	Off		
	cu.	Freeway Volu		3517					l =	ft	
L <sub>up</sub> =	ft	Ramp Volume, V <sub>R</sub> 8							L <sub>down</sub> =	11	
V,, = v	/eh/h		-Flow Speed, S <sub>FF</sub>	60.0				,	V <sub>D</sub> =	veh/h	
<u> </u>			ow Speed, S <sub>FR</sub>	25.0							
Conversion t	to pc/h Und	der Base	Conditions								
(pc/h)	(pc/h) V PHF Terr		Terrain	%Truck	%Rv		f <sub>HV</sub>	f <sub>p</sub>	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>	
Freeway	3517	0.90	Level	12	0	0.	943	1.00	414	2	
Ramp	800	0.90	Level	20	0	0.	909	1.00	97	8	
UpStream						_					
DownStream		I I Merge Areas						iverge Areas			
Estimation o		Meige Aleas			Estimati	ion o		iverge Areas			
		<u> </u>			200,,,,,,,,				`-		
$V_{12} = V_F (P_{FM})$								$V_R + (V_F - V_R)$			
L <sub>EQ</sub> = (Equation 13-6 or 13-7)							-	Equation 13-1			
P <sub>FM</sub> =	_	Equation (	exhibit 13-6)		P <sub>FD</sub> =			000 using Equ	iation (Exhib	it 13-7)	
V <sub>12</sub> =	pc/h				V <sub>12</sub> =			42 pc/h			
$V_3$ or $V_{av34}$			-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>			pc/h (Equatio	n 13-14 or	13-17)	
Is $V_3$ or $V_{av34} > 2,70$								Yes ☑ No			
Is $V_3$ or $V_{av34} > 1.5$			10 10 10		Is V <sub>3</sub> or V <sub>av3</sub>	<sub>34</sub> > 1.5		Yes ☑ No	10 10 10	10 10	
If Yes,V <sub>12a</sub> =	pc/h ( 13-19)	Equation 13	-16, 13-18, or		If Yes,V <sub>12a</sub> = pc/h (Equation 13-16, 13-18, or 13						
Capacity Che					Capacity Checks						
Cupacity Circ	Actual		apacity	LOS F?	Actual Capacity LOS						
	7 totaar	Ī	apaony	20011	V <sub>F</sub>		4142	Exhibit 13-8	1 -	No	
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$	- V_	3164	Exhibit 13-8	_	No	
*FO		LAHIDIC 13-0				*R	978	Exhibit 13-10			
		<u> </u>			V <sub>R</sub>					No	
Flow Enterin	1			1 10 10 0	Flow En	_		ge Influenc		\"   " O	
	Actual		Desirable	Violation?	\/	$\overline{}$	Actual	Max Desirab		Violation?	
V <sub>R12</sub>	. 5 (	Exhibit 13-8	· · · · · · · · · · · · · · · · · · ·		V <sub>12</sub>		142	Exhibit 13-8	4400:All	No	
Level of Serv					_			termination	•	)	
$D_R = 5.475 + 0$	• • • • • • • • • • • • • • • • • • • •	u.uu/8 V <sub>12</sub> -	0.00627 L <sub>A</sub>					0086 V <sub>12</sub> - 0.0	วดล r <sup>D</sup>		
D <sub>R</sub> = (pc/mi/lr	•				I		/mi/ln)				
LOS = (Exhibit							oit 13-2)				
Speed Deteri	Speed Determination					eter	minatio	n			
M <sub>S</sub> = (Exibit 1	3-11)				$D_{\rm s} = 0.646 \text{ (Exhibit 13-12)}$						
	nibit 13-11)				S <sub>R</sub> = 48.4 mph (Exhibit 13-12)						
	nibit 13-11)				$S_0$ = N/A mph (Exhibit 13-12)						
	• •					S = 48.4 mph (Exhibit 13-13)					
Convright © 2012 Univ	pyright © 2012 University of Florida, All Rights Reserved						n 6.41	Ger	nerated: 12/9/	2014 9·09 A	

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	T	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	3205-CI NB On	emFerry NB Off to
Date Performed	7/25/2014		Jurisdiction	NB OII	
Analysis Time Period	AM Peak		Analysis Year	2018 Βι Site	ıild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			es.(N)	☐ Plar	ning Data
Flow Inputs					
Volume, V AADT	2712	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 12	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length	Level mi	
			Up/Down %		
Calculate Flow Adjus	tments				
$f_p$	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.943	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		$f_{LC}$		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			,
LOS and Performanc	e Measures	3	Design (N)		
0			Design (N)		
Operational (LOS)	NI v. f		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x)$	1597	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	$N \times f_{HV}$	no/h/ln
x f <sub>p</sub> ) S	60.0	mnh	x f <sub>p</sub> )		pc/h/ln
	26.6	mph	S		mph
D = v <sub>p</sub> / S LOS	26.6 D	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LO3	D		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed	E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens	ity	$E_{\rm T}$ - Exhibits 11-10, 11-11,		f <sub>LC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate	FFS - Free	e-flow speed	$f_{\rm n}$ - Page 11-18		TRD - Page 11-1
LOS - Level of service	BFFS - Ba	ase free-flow	LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2	IND - Fage 11-1
speed	hour volume		11-3	11-4,	
DDHV - Directional design	nour volume				

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	T	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>I-526 El</i>	В
Agency or Company	Atkins		From/To	3205-C	lemFerry NB Off to
Date Performed	7/25/2014		Jurisdiction	NB On	
Analysis Time Period	PM Peak		Analysis Year	2018 Bi Site	uild - River Center
Project Description Navy	Base ICTF			0.10	
✓ Oper.(LOS)			Des.(N)	Pla	nning Data
Flow Inputs					
Volume, V AADT	2717	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 12	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments				
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.943	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph		00.0	p.ii
LOS and Performanc	e Measures	<del></del>	Design (N)		
			Design (N)		
Operational (LOS)			Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x I)$	N x t <sub>HV</sub> 1600	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>uv</sub>	
x f <sub>p</sub> )		•	x f <sub>p</sub> )	110	pc/h/ln
S	60.0	mph	S P		mph
$D = v_p / S$	26.7	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	D		Required Number of Lanes	s, N	·
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed	E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens	sity	$E_{\rm R}$ - Exhibits 11-10, 11-12 $E_{\rm T}$ - Exhibits 11-10, 11-11,	11-13	$f_{LC}$ - Exhibit 11-9
v <sub>p</sub> - Flow rate	FFS - Free	e-flow speed	1 '	11-13	
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18	11_2	TRD - Page 11-11
speed DDHV - Directional design	hour volume		LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-4,	
DDITY - Directional design	noui voluine				

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			MPS AND	RAMP JUN			EET				
General I	Inform	ation			Site Infor	mation					
Analyst		AJR		Fr	reeway/Dir of Tr	avel	I-526 E	ΞB			
gency or Co		Atkin	S		unction		3210-l	EB On from	Clements Ferr	У	
ate Performe		7/25/			ırisdiction	2018 Build - River Center Site					
nalysis Time		AM P		Aı	nalysis Year						
	iption N	avy Base ICT	F								
nputs			l							1	
Ipstream Adj	Ramp		1	ber of Lanes, N	2					Downstre	eam Adj
			Ramp Number	of Lanes, N	1					Ramp	
Yes	☐ On		Acceleration L	ane Length, L <sub>A</sub>	1025					□Yes	On
✓ No	Off		Deceleration L	ane Length L <sub>D</sub>							_
			Freeway Volur	me, V <sub>E</sub>	2712					☑ No	Off
<sub>ap</sub> =	ft		Ramp Volume	'	380					L <sub>down</sub> =	ft
2P			1	Flow Speed, S <sub>FF</sub>	60.0						
' <sub>u</sub> =	veh/h		1							$V_D =$	veh/h
		// //	Ramp Free-Flo	110	45.0						
onversi	on to		der Base (	Conditions	1	1	_				
(pc/h)		V (Veh/hr)	PHF	Terrain	%Truck	%Rv		$f_{HV}$	$f_p$	v = V/PH	$F x f_{HV} x f_{p}$
reeway		2712	0.90	Level	12	0		.943	1.00	+	3194
Ramp		380	0.90	Level	9	0	_	.957	1.00	+	441
JpStream		000	0.30	LCVCI	<u> </u>	<del>                                     </del>	╅	.501	1.00	+	771
ownStream							+				
			Merge Areas		•			D	iverge Areas		
stimatio	on of v	12				Estimat	ion d	of V <sub>12</sub>			
			/ P \						V <sub>R</sub> + (V <sub>F</sub> - V	\P	
$V_{12} = V_F (P_{FM})$						_		. =			10\
EQ = (Equation 13-6 or 13-7)						L <sub>EQ</sub> =			Equation 13		
FM =				ion (Exhibit 13-6)	)	P <sub>FD</sub> =			ısing Equati	on (Exhibit 1	3-7)
12 =		3194				V <sub>12</sub> =			oc/h		
<sub>3</sub> or V <sub>av34</sub>		-		13-14 or 13-17)	)	$V_3$ or $V_{av34}$			oc/h (Equation		17)
s $V_3$ or $V_{av34}$	> 2,700	pc/h? 🗌 Yes	s 🗹 No			Is V <sub>3</sub> or V <sub>av</sub>	<sub>34</sub> > 2,7	700 pc/h? [	Yes No		
s V <sub>3</sub> or V <sub>av34</sub>	> 1.5 * V	″ <sub>12</sub> /2 □ Yes	s 🗹 No			Is V <sub>3</sub> or V <sub>av</sub>	,34 > 1.5	5 * V <sub>12</sub> /2	]Yes □ No		
Yes,V <sub>12a</sub> =		pc/h	(Equation 13	-16, 13-18, or		If Yes,V <sub>12a</sub> =		p	c/h (Equation		13-18, or
	<u> </u>	13-19)							3-19)		
Capacity	Chec					Capacit	y Ch				
		Actual	C	apacity	LOS F?		-	Actual		apacity	LOS F?
						V <sub>F</sub>			Exhibit 13	8-8	
$V_{FO}$		3635	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>		Exhibit 13	3-8	
FO						V <sub>R</sub>			Exhibit 1	3-	
									10		
low Ent	ering		fluence A			Flow En			ge Influe		
		Actual		Desirable	Violation?			Actual	Max De	sirable	Violation?
$V_{R12}$		3635	Exhibit 13-8	4600:AII	No	V <sub>12</sub>			Exhibit 13-8		
evel of	Servic	e Detern	nination (i	f not F)		Level of	f Ser	vice De	terminati	on (if no	t F)
D <sub>R</sub> = 5	5.475 + 0.	00734 v <sub>R</sub> + 0	0.0078 V <sub>12</sub> - 0.0	0627 L <sub>A</sub>			D <sub>R</sub> = 4	4.252 + 0.	0086 V <sub>12</sub> - 0	0.009 L <sub>D</sub>	
R = 27.5	2 (pc/mi/li	n)				$D_R = (p$	oc/mi/	ln)			
	" Exhibit 13	-				1		t 13-2)			
									n		
Speed Determination						Speed L			11		
•	77 (Exibit					D <sub>s</sub> = (Exhibit 13-12)					
R= 53.2	2 mph (E	khibit 13-11)				S <sub>R</sub> = mph (Exhibit 13-12)					
	mph (Ex	hibit 13-11)				$S_0 = mph (Exhibit 13-12)$					
	2 mnh /E	khibit 13-13)				S = mph (Exhibit 13-13)					
= 53.2	z mpn (⊏	(111011 13-13)				<b>b</b> = m	HCS2010 <sup>TM</sup> Version 6.41 Generated: 12/9/2014 9:1 <sup>-</sup>				

		RAI	MPS AND	RAMP JUN	CTIONS W	ORKSH	EET					
General li	nforma				Site Infor		<u> </u>					
Analyst		AJR		Fr	eeway/Dir of Tr		I-526 E	В				
gency or Con		Atkins	S	Ju	nction		3210-E	B On from	Clements Ferry	1		
ate Performe		7/25/2	2014		risdiction							
nalysis Time		PM P		Ar	nalysis Year		2018 B	uild - River	Center Site			
roject Descrip	otion Na	vy Base ICT	F									
nputs			l							1		
Jpstream Adj F	Ramp			ber of Lanes, N	2					Downstre	am Adj	
			Ramp Number	of Lanes, N	1					Ramp		
Yes	On		Acceleration L	ane Length, L <sub>A</sub>	1025					□Yes	On	
✓ No	Off		Deceleration L	ane Length L <sub>D</sub>							_	
			Freeway Volur	ne, V <sub>F</sub>	2717					✓ No	Off	
up =	ft		Ramp Volume	, V <sub>D</sub>	582					L <sub>down</sub> =	ft	
				Flow Speed, S <sub>FF</sub>	60.0							
' <sub>u</sub> = \	veh/h		1	ow Speed, S <sub>FR</sub>	45.0					$V_D =$	veh/h	
Na mi ra ra l	1	- a /b		111	45.0							
onversion	on to p	V V		Conditions	1	1	1	1				
(pc/h)		(Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	$f_p$	v = V/PHI	$= x f_{HV} x f_{p}$	
reeway	$\neg$	2717	0.90	Level	12	0	0.	943	1.00	;	3200	
Ramp		582	0.90	Level	5	0	_	976	1.00		663	
JpStream												
DownStream												
					iverge Areas							
stimatio	n of v	12				Estimat	ion o	f v <sub>12</sub>				
		V <sub>12</sub> = V <sub>F</sub>	(P <sub>EM</sub> )					V <sub>12</sub> = \	V <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>	)P <sub>ED</sub>		
L <sub>EQ</sub> = (Equation 13-6 or 13-7)						L <sub>EQ</sub> =			Equation 13-		3)	
P <sub>FM</sub> = 1.000 using Equation (Exhibit 13-6)						P <sub>FD</sub> =			ising Equation			
гм 12 =		3200 p		iori (Exilibit 10 0)		V <sub>12</sub> =			oc/h	711 (EXIIIDIC 1	0 . ,	
<sub>3</sub> or V <sub>av34</sub>				12 14 or 12 1 <del>7</del> \					oc/h (Equation <sup>-</sup>	12 11 or 12 1	17\	
	> 2 700 n			13-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>	× 2 7			13-14 01 13-	17)	
s V <sub>3</sub> or V <sub>av34</sub>									Yes No			
s V <sub>3</sub> or V <sub>av34</sub>	> 1.5 " V <sub>1</sub>			16 12 19 or		1			Yes No		2 10 0"	
Yes,V <sub>12a</sub> =		pc/n ( 13-19)		-16, 13-18, or		If Yes,V <sub>12a</sub> =	:		oc/h (Equatio 3-19)	n 13-16, 1	3-18, or	
Capacity	Check					Capacit	v Ch		,			
		Actual	С	apacity	LOS F?	1		Actual	Ca	pacity	LOS F?	
						V <sub>F</sub>			Exhibit 13-			
\/		2002	E 131340 0			$V_{FO} = V_{F}$	- V_		Exhibit 13-	8		
$V_{FO}$		3863	Exhibit 13-8		No		*R		Exhibit 13			
						V <sub>R</sub>			10			
low Ente	ering N	/lerge In	fluence A	rea		Flow En	terin	g Diver	ge Influer	ice Area		
		Actual	Max [	Desirable	Violation?		_	Actual	Max Des		Violation'	
$V_{R12}$		3863	Exhibit 13-8	4600:AII	No	V <sub>12</sub>			Exhibit 13-8			
	Service	Detern	nination (i	f not F)		<del></del>	Serv	ice De	terminatio	n (if not	F)	
			0.0078 V <sub>12</sub> - 0.0						0086 V <sub>12</sub> - 0			
	(pc/mi/ln)		12	A		L	c/mi/lı		12	D		
	xhibit 13-						Exhibit	,				
•						_			-			
Speed De						Speed L			п			
1 - 0.44	4 (Exibit 1	3-11)				D <sub>s</sub> = (Exhibit 13-12)						
		sibit 12 11\				S <sub>R</sub> = mph (Exhibit 13-12)						
	mph (Exl	11011 13-11)				K		,				
R= 52.5		ibit 13-11)						nibit 13-12)				
R= 52.5 0= N/A	mph (Exh	-				$S_0 = m$	ph (Exh					

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	T	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>I-526 EB</i>	}
Agency or Company	Atkins		From/To	3220-	
Date Performed	7/25/2014		Jurisdiction	Clement	sFerrytoRiversLand
Analysis Time Period	AM Peak		Analysis Year	2018 Bu Site	ild - River Center
Project Description Navy	Base ICTF			<u> </u>	
✓ Oper.(LOS)			Des.(N)	Pla	nning Data
Flow Inputs					
Volume, V	3092	veh/h	Peak-Hour Factor, PHF	0.90	
AADT		veh/day	%Trucks and Buses, $P_T$	10	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D		In On	General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments				
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R -$	1)] 0.952	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	·
Base free-flow Speed,		•	FF5	60.0	mph
BFFS		mph			
LOS and Performanc	e Measures	6	Design (N)		
Operational (LOS)			Design (N)		
$v_p = (V \text{ or DDHV}) / (PHF x)$	Nyf		Design LOS		
v f )	1804	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	pc/h/ln
x f <sub>p</sub> ) S	59.2	mph	x f <sub>p</sub> )		ροπιπι
		•	S		mph
D = v <sub>p</sub> / S	30.5	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	D		Required Number of Lane	es, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed	E <sub>R</sub> - Exhibits 11-10, 11-12	<del></del>	f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens	sity	$E_{\rm R}$ - Exhibits 11-10, 11-11		$f_{LC}$ - Exhibit 11-9
v <sub>p</sub> - Flow rate	FFS - Free	e-flow speed	'	, 11-10	
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18	. 11 0	TRD - Page 11-11
speed			LOS, S, FFS, v <sub>p</sub> - Exhibits	5 II-∠,	
DDHV - Directional design	hour volume		111-0		

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	T	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	3220-	sFerrytoRiversLand
Date Performed	7/25/2014		Jurisdiction	Ciements	si errytortiverscand
Analysis Time Period	PM Peak		Analysis Year	2018 Bui Site	ld - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	3299	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 9	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length Up/Down %	Level mi	
Calculate Flow Adjus	tmonto		Op/Down %		
				4.0	
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R -$		
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		$f_{LC}$		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			·
LOS and Performanc	e Measures	3	Design (N)		
			Design (N)		
Operational (LOS)	NI f		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x)$	N X T <sub>HV</sub> 1915	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	
x f <sub>p</sub> )	50.0		x f <sub>p</sub> )		pc/h/ln
S	58.2	mph	S		mph
$D = v_p / S$	32.9	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	D		Required Number of Lane	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed		<b>.</b>	f Fileling 44.0
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>p</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11	, 11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18	44.0	TRD - Page 11-1
speed			LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	
DDHV - Directional design	hour volume		11-3		

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		RAMP	S AND RAN	/IP JUNCTI	ONS WO	RKS	HEET			
General Infor	mation	2 HITT		Site Infor			·			
Analyst Agency or Company	AJR	s		reeway/Dir of Tr	avel	I-526 E 3230-E		ver Landing		
Date Performed	7/25/2		J	urisdiction				Ü		
Analysis Time Period			Α	Analysis Year		2018 B	uild - River	Center Site		
Project Description	Navy Base ICT	F								
Inputs		1								
Upstream Adj R	amp	Freeway Num Ramp Numbe	ber of Lanes, N r of Lanes, N	2 1					Downstrea Ramp	m Adj
□Yes	On	1	ane Length, L <sub>A</sub>						Yes	On
✓ No	Off	Freeway Volu	ane Length L <sub>D</sub>	800 3092					<b>☑</b> No	Off
L <sub>up</sub> = f	$L_{up} = ft$ Ramp Volume, $V_R$								L <sub>down</sub> =	ft
V <sub>11</sub> = v	eh/h		-Flow Speed, $S_{FF}$ ow Speed, $S_{FR}$	65.0				,	V <sub>D</sub> =	veh/h
	45.0									
Conversion t	· -	der Base	Conditions							
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		$f_{HV}$	f <sub>p</sub>	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>
Freeway	3092	10	0	0.	952	1.00	360	)7		
Ramp	·				0	0.	985	1.00	86	4
UpStream DownStream			+							
		Merge Areas					Ď	iverge Areas		
Estimation of	F V <sub>12</sub>				Estimat	ion o	f v <sub>12</sub>			
	V <sub>12</sub> = V <sub>F</sub>	( P <sub>FM</sub> )					V <sub>12</sub> =	V <sub>R</sub> + (V <sub>F</sub> - V <sub>R</sub>	)P <sub>ED</sub>	
L <sub>EQ</sub> =	(Equa	tion 13-6 or	13-7)		L <sub>EQ</sub> =		(E	Equation 13-1	2 or 13-13)	
P <sub>FM</sub> =	using	Equation (	Exhibit 13-6)		P <sub>FD</sub> =		1.0	000 using Equ	ation (Exhib	oit 13-7)
V <sub>12</sub> =	pc/h				V <sub>12</sub> =		36	07 pc/h		
V <sub>3</sub> or V <sub>av34</sub>	pc/h (	Equation 13	-14 or 13-17)		$V_3$ or $V_{av34}$		0	pc/h (Equatio	n 13-14 or	13-17)
Is $V_3$ or $V_{av34} > 2,70$	00 pc/h?	s 🗌 No			Is V <sub>3</sub> or V <sub>av</sub>	34 > 2,7	00 pc/h? [	Yes ☑ No		
Is V <sub>3</sub> or V <sub>av34</sub> > 1.5	* V <sub>12</sub> /2	s 🗌 No			Is V <sub>3</sub> or V <sub>av</sub>	3 <sub>4</sub> > 1.5	* V <sub>12</sub> /2	Yes ☑ No		
If Yes,V <sub>12a</sub> =	pc/h (	Equation 13	-16, 13-18, or		If Yes,V <sub>12a</sub> =	:		c/h (Equation	13-16, 13-	18, or 13-
Capacity Che	13-19)				Capacity Checks					
	Actual		apacity	LOS F?	Capacit	<i>y 011</i>	Actual	Car	pacity	LOS F?
	7.000.		apaon)		V <sub>F</sub>		3607	Exhibit 13-8	1	No
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$	- V <sub>R</sub>	2743	Exhibit 13-8	4700	No
					V <sub>R</sub>		864	Exhibit 13-10	2100	No
Flow Entering	d Merge In	fluence A	rea		Flow En	terin	g Diver	ge Influenc	e Area	
•	Actual		Desirable	Violation?		_	Actual	Max Desirab		Violation?
V <sub>R12</sub>		Exhibit 13-8			V <sub>12</sub>	3	3607	Exhibit 13-8	4400:All	No
Level of Serv								terminatior		5)
$D_R = 5.475 + 0.$	* *	0.0078 V <sub>12</sub> -	0.00627 L <sub>A</sub>			D <sub>R</sub> = 4	1.252 + 0.	0086 V <sub>12</sub> - 0.0	009 L <sub>D</sub>	
D <sub>R</sub> = (pc/mi/ln	•				l .,		/mi/ln)			
,	· · · · · · · · · · · · · · · · · · ·						oit 13-2)			
	Speed Determination						minatio			
M <sub>S</sub> = (Exibit 1	*				1 *	-	xhibit 13-			
						$S_R^{=}$ 56.4 mph (Exhibit 13-12) $S_0^{=}$ N/A mph (Exhibit 13-12)				
	nibit 13-11)				1 '		•	•		
					HCS2010 <sup>TM</sup>		(Exhibit		nerated: 12/9/	2014 0:12 A

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		RAMP	S AND RAN	IP JUNCTI	ONS WO	RKS	HEET			
General Infor	mation	10 000	<u> </u>	Site Infor		11110				
Analyst Agency or Company	AJR	<u> </u>		reeway/Dir of Tr	avel	I-526 E		ver Landing		
Date Performed	7/25/2			urisdiction		0200 L	D OII to I ti	ver Landing		
Analysis Time Period			A	nalysis Year		2018 B	uild - River	Center Site		
Project Description	Navy Base ICT	F								
Inputs										
Upstream Adj R	amp	Freeway Num Ramp Numbe	ber of Lanes, N	2 1					Downstrea Ramp	m Adj
□Yes	On	Acceleration L	ane Length, L <sub>A</sub>						Yes	On
✓ No	Off	Deceleration I Freeway Volu	Lane Length L <sub>D</sub> me, V <sub>⊏</sub>	800 3299					<b>☑</b> No	Off
L <sub>up</sub> = f	$L_{up}$ = ft Ramp Volume, $V_R$ Freeway Free-Flow Speed, $S_{FF}$								L <sub>down</sub> =	ft
V <sub>u</sub> = v	V <sub>u</sub> = veh/h Ramp Free-Flow Speed, S <sub>FR</sub>							,	V <sub>D</sub> =	veh/h
Conversion to	o pc/h Und	der Base	Conditions							
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	f <sub>p</sub>	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>
Freeway						0.	957	1.00	383	31
Ramp	·				0	0.	985	1.00	89	3
UpStream  DownStream	<del> </del>		+							
Downoucam		Merge Areas						iverge Areas		
Estimation of					Estimat	ion o				
	V <sub>12</sub> = V <sub>F</sub>	(P)						V <sub>R</sub> + (V <sub>F</sub> - V <sub>R</sub>	\P	
l =	12 1	tion 13-6 or	13 7)		=			TRICKET VE Equation 13-1:		
L <sub>EQ</sub> = P =		Equation (F			L <sub>EQ</sub> =			200 using Equ		
P <sub>FM</sub> = V <sub>12</sub> =	pc/h	Lquation (i	EXTIIDIC 10 0)		P <sub>FD</sub> = V <sub>12</sub> =			31 pc/h	iation (Exilic	10-1)
V <sub>3</sub> or V <sub>av34</sub>	•	Fauation 13	-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>			pc/h (Equatio	n 13 <sub>-</sub> 14 or	13_17)
Is $V_3$ or $V_{av34} > 2,70$			14 61 16 17)			>27		Yes ☑ No	11 10 14 01	10 17)
Is $V_3$ or $V_{av34} > 1.5$						• •				
If Yes,V <sub>12a</sub> =		Equation 13	-16, 13-18, or		Is $V_3$ or $V_{av34} > 1.5 * V_{12}/2$ Yes No pc/h (Equation 13-16, 13-18, or 13 19)					18, or 13-
Capacity Che					Capacit	y Ch		,		
	Actual	С	apacity	LOS F?			Actual	Cap	pacity	LOS F?
					V <sub>F</sub>		3831	Exhibit 13-8	4700	No
$V_{FO}$		Exhibit 13-8			V <sub>FO</sub> = V <sub>F</sub>	- V <sub>R</sub>	2938	Exhibit 13-8	4700	No
					V <sub>R</sub>		893	Exhibit 13-10	2100	No
Flow Entering	Merae In	fluence A	rea		Flow En	terin	a Divei	ge Influenc	ce Area	
	Actual		Desirable	Violation?		_	Actual	Max Desirab		Violation?
V <sub>R12</sub>		Exhibit 13-8			V <sub>12</sub>	3	3831	Exhibit 13-8	4400:All	No
Level of Serv	Level of Service Determination (if not F)				Level of	Ser	∕ice De	termination	ı (if not F	-)
$D_R = 5.475 + 0.$	00734 v <sub>R</sub> + 0	0.0078 V <sub>12</sub> -	0.00627 L <sub>A</sub>			D <sub>R</sub> = 4	.252 + 0.	.0086 V <sub>12</sub> - 0.0	009 L <sub>D</sub>	
D <sub>R</sub> = (pc/mi/ln	)				D <sub>R</sub> = 30	0.0 (pc	/mi/ln)			
LOS = (Exhibit	13-2)				LOS = D	(Exhil	oit 13-2)			
Speed Detern	Speed Determination					Deter	minatio	n		
M <sub>S</sub> = (Exibit 1:	S = (Exibit 13-11)					378 (E	xhibit 13-	12)		
						-	(Exhibit	*		
	ibit 13-11)				ľ		(Exhibit '(Exhibit)	*		
					HCS2010 <sup>TM</sup>		-	-	nerated: 12/9/	2014 0:12 4

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	3235-Ri On	verLa Off to RiverLa
Date Performed	7/25/2014		Jurisdiction	On	
Analysis Time Period	AM Peak		Analysis Year	2018 Bu Site	ıild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			es.(N)	☐ Plar	nning Data
Flow Inputs					
Volume, V AADT	2326	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 11	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D			%RVs, P <sub>R</sub> General Terrain:	0 Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments				
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] 0.948	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	65.0	mph	FFS	65.0	mph
Base free-flow Speed, BFFS		mph		00.0	Прп
LOS and Performanc	e Measures	6	Design (N)		
0			Design (N)		
Operational (LOS)	Al v. f		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x I x f_p)$	1363	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	pc/h/ln
S	65.0	mph	x f <sub>p</sub> ) S		mph
$D = v_p / S$	21.0	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	С		Required Number of Lanes	s, N	релиин
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed	E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens	ity	$E_{\rm T}$ - Exhibits 11-10, 11-11,		f <sub>LC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate		e-flow speed	f <sub>n</sub> - Page 11-18	-	TRD - Page 11-11
LOS - Level of service speed		ase free-flow	LOS, S, FFS, $v_p$ - Exhibits 11-3	11-2,	
DDHV - Directional design	nour volume		1		

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	BASIC FRI	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	l <i>I-</i> 526 EE	3
Agency or Company	Atkins		From/To	3235-Ri	erLa Off to RiverLa
Date Performed	7/25/2014		Jurisdiction	On	
Analysis Time Period	PM Peak		Analysis Year	2018 Bu Site	ild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plan	ning Data
Flow Inputs					
Volume, V AADT	2507	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 11	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi	
Calculate Flow Adjus	tments		· ·		
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)1 <i>0.948</i>	
Speed Inputs	-		Calc Speed Adj and I		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	65.0	mph	FFS	65.0	•
Base free-flow Speed, BFFS		mph	FFS	65.0	mph
LOS and Performanc	e Measures	}	Design (N)		
Operational (LOS) v <sub>p</sub> = (V or DDHV) / (PHF x	N x f <sub>HV</sub>		Design (N) Design LOS		
x f <sub>p</sub> )	11469	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x t <sub>HV</sub>	pc/h/ln
S	64.9	mph	x f <sub>p</sub> )		·
$D = v_p / S$	22.6	pc/mi/ln	S		mph
Los	С	·	$D = v_p / S$ Required Number of Lanes	s, N	pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service			E <sub>R</sub> - Exhibits 11-10, 11-12 E <sub>T</sub> - Exhibits 11-10, 11-11, f <sub>p</sub> - Page 11-18		f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-11
speed DDHV - Directional design		-	LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-2,	

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			MPS AND	RAMP JUN			<u> </u>			
General	Inform	nation			Site Infor	mation				
Analyst		AJR		Fr	eeway/Dir of Tr	avel	I-526 EB			
gency or C		Atkin	S		ınction	;	3240-EB On froi	m River Landing		
ate Perforr		7/25/			ırisdiction					
nalysis Tim		AM F		Ar	nalysis Year		2018 Build - Riv	er Center Site		
	cription I	Navy Base ICT	TF							
nputs			1						T	
Jpstream A	di Ramp		Freeway Numb	per of Lanes, N	2				Downstre	am Adi
			Ramp Number	of Lanes, N	1				Ramp	,
☐ Yes	On		Acceleration L	ane Length, L <sub>Δ</sub>	1400				□Yes	On
<b>-</b>	o#		Deceleration L	7.						
✓ No	Off		Freeway Volur		2326				✓ No	Off
_	ft		1	'					L <sub>down</sub> =	ft
up =	It		Ramp Volume	11	620				-down	
/ <sub>u</sub> =	veh/h		Freeway Free-	Flow Speed, S <sub>FF</sub>	65.0				V <sub>D</sub> =	veh/h
u	VC11/11		Ramp Free-Flo	ow Speed, S <sub>FR</sub>	25.0					
Convers	sion to	pc/h Und	der Base (	Conditions						
(pc/h	ĺ	V	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	fp	v = V/PH	F x f <sub>HV</sub> x f <sub>p</sub>
	.,	(Veh/hr)						· ·	-	
reeway		2326	0.90	Level	11	0	0.948	1.00		2727
Ramp		620	0.90	Level	10	0	0.952	1.00		723
JpStream										
DownStrear	n		Marria Araaa					Diverse Areas		
Ectimat	ion of	· ·	Merge Areas			Ectimati	on of v <sub>12</sub>	Diverge Areas		
stimat	1011 01					LSumau	<u>:=</u> _			
		$V_{12} = V_{F}$	(P <sub>FM</sub> )				V <sub>12</sub> =	= V <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>	R)P <sub>FD</sub>	
EQ =		(Equa	ation 13-6 or	13-7)		L <sub>EQ</sub> =		(Equation 13-	-12 or 13-	13)
P <sub>FM</sub> =		1.000	using Equati	on (Exhibit 13-6)	ı	P <sub>FD</sub> =		using Equation	on (Exhibit 1	3-7)
/ <sub>12</sub> =		2727		,		V <sub>12</sub> =		pc/h	,	,
$V_3$ or $V_{av34}$				3-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>		pc/h (Equation	13 1/Lor 13	17\
	> 2.700	pc/h? Yes		13-14-01-13-17)	1		> 2 700 no/b2			11)
								☐Yes ☐ No		
		V <sub>12</sub> /2 □ Ye		40 40 40		is v <sub>3</sub> or v <sub>av3</sub>	<sub>4</sub> > 1.5 ° V <sub>12</sub> /2	☐ Yes ☐ No		10.40
Yes,V <sub>12a</sub> =	:	pc/h 13-19)		-16, 13-18, or		If Yes,V <sub>12a</sub> =		pc/h (Equatio 13-19)	n 13-16, 1	13-18, or
Capacit	v Chor						/ Checks	13-19)		
apacit	y Cire	Actual		apacity	LOS F?	Capacity	Actua	l Ca	pacity	LOS F
		Notual	<del>l ĭ</del>	араску	LOOTE	V <sub>F</sub>	Actua	Exhibit 13-		1 2001
						$\vdash$				
$V_{FC}$		3450	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>	Exhibit 13-		
						$V_R$		Exhibit 13	3-	
-, -	<u> </u>	***	<i>(</i> 4				<u> </u>	10		
-low En	tering		fluence A		1 15 1 5 0	Flow En	<del>,                                     </del>	erge Influer		
		Actual		Desirable	Violation?	.,	Actual	Max Des	irable	Violation
V <sub>R1</sub>		3450	Exhibit 13-8	4600:All	No	V <sub>12</sub>		Exhibit 13-8		
evel of	Servi	ce Detern	nination (i	f not F)		Level of	Service D	eterminatio	n (if not	t F)
D <sub>R</sub> =	5.475 + 0	0.00734 v <sub>R</sub> + 0	0.0078 V <sub>12</sub> - 0.0	0627 L <sub>A</sub>		[	$O_R = 4.252 +$	0.0086 V <sub>12</sub> - 0	.009 L <sub>D</sub>	
<sub>R</sub> = 23	3.3 (pc/mi/	ln)				$D_R = (p$	c/mi/ln)			
	(Exhibit 1	3-2)					xhibit 13-2)			
						<u> </u>		ion		
•		ination				<del>  '</del>	eterminat	ion		
•	374 (Exib	-				I * .	xhibit 13-12)			
$S_R = 56$	6.4 mph (E	Exhibit 13-11)				S <sub>R</sub> = mp	oh (Exhibit 13-12	2)		
	A mph (E	xhibit 13-11)				$S_0 = mp$	oh (Exhibit 13-12	2)		
'n IN/		,								
0	6.4 mph (E	Exhibit 13-13)				S = mp	oh (Exhibit 13-13	3)		

	RAI	MPS AND	RAMP JUNG	SHONS W	ORKSHE	:E1			
General Info				Site Infor					
Analyst	AJR		Fr	eeway/Dir of Tr	avel I	l-526 EB			
Agency or Compan	y Atkin	IS	Ju	nction	3	3240-EB On fro	m River Landing		
Date Performed	4/25/	/2014	Ju	risdiction					
Analysis Time Perio			Ar	alysis Year	2	2018 Build - Riv	er Center Site		
Project Description	Navy Base ICT	ſF							
nputs								1	
Jpstream Adj Ramp	)	1 '	ber of Lanes, N	2				Downstre	am Adj
		Ramp Numbe	r of Lanes, N	1				Ramp	
Yes O	n	Acceleration L	ane Length, L <sub>A</sub>	1400				□Yes	On
☑No ☐O	ıff	Deceleration I	ane Length L <sub>D</sub>						
		Freeway Volu	me, V <sub>F</sub>	2507				☑ No	Off
<sub>rup</sub> = ft		Ramp Volume	, V <sub>D</sub>	510				L <sub>down</sub> =	ft
			-Flow Speed, S <sub>FF</sub>	65.0				1.	
$t_{\rm u} = {\rm veh/}$	h	1	ow Speed, S <sub>FR</sub>	25.0				$V_D =$	veh/h
Conversion	to no/h lin		* 110	20.0					
	lo pc/II one		Conditions			1	1	1	
(pc/h)	(Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	f <sub>p</sub>	v = V/PHF	$-x f_{HV} x f_{p}$
Freeway	2507	0.90	Level	11	0	0.948	1.00	2	2939
Ramp	510	0.90	Level	10	0	0.952	1.00		595
UpStream									
DownStream									
Merge Areas					F - 4! 4!		Diverge Areas		
Estimation o	7 V <sub>12</sub>				Estimati	on of v <sub>12</sub>			
	$V_{12} = V_{F}$	(P <sub>FM</sub> )				V <sub>12</sub> =	= V <sub>R</sub> + (V <sub>F</sub> - V	<sub>R</sub> )P <sub>FD</sub>	
- <sub>EQ</sub> =	(Equ	ation 13-6 or	13-7)		L <sub>EQ</sub> =		(Equation 13	3-12 or 13-1	3)
P <sub>FM</sub> =	1.000	using Equat	ion (Exhibit 13-6)		P <sub>FD</sub> =		using Equati	on (Exhibit 1	3-7)
/ <sub>12</sub> =	2939	pc/h			V <sub>12</sub> =		pc/h	•	•
/ <sub>3</sub> or V <sub>av34</sub>		•	13-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>		pc/h (Equation	13-14 or 13-1	7)
Is V <sub>3</sub> or V <sub>av34</sub> > 2,7			,			, > 2.700 pc/h?	☐Yes ☐ No		,
Is V <sub>3</sub> or V <sub>av34</sub> > 1.5							☐Yes ☐ No		
			3-16, 13-18, or		1		pc/h (Equation		3-18. or
Yes,V <sub>12a</sub> =	13-19)				If Yes,V <sub>12a</sub> =		13-19)		,
Capacity Ch	ecks				Capacity	/ Checks			
	Actual	C	Capacity	LOS F?		Actua		apacity	LOS F?
					V <sub>F</sub>		Exhibit 13	i-8	
				1			II		
$V_{EO}$	3534	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>	Exhibit 13	)-O	
$V_{FO}$	3534	Exhibit 13-8		No	-	- V <sub>R</sub>	Exhibit 1		
				No	V <sub>R</sub>		Exhibit 1	3-	
	g Merge In	nfluence A			V <sub>R</sub>	tering Div	Exhibit 1 10 erge Influe	3- nce Area	
Flow Enterin	g Merge In	nfluence A	Desirable	Violation?	V <sub>R</sub>		Exhibit 1 10 erge Influe Max De	3- nce Area	Violation
Flow Enterin	Actual 3534	Max Exhibit 13-8	Desirable 4600:All		V <sub>R</sub>	tering Div	Exhibit 1 10 erge Influe Max De Exhibit 13-8	nce Area sirable	Violation
V <sub>R12</sub> Level of Serv	Actual 3534	mfluence A Max Exhibit 13-8 mination (	Desirable 4600:All <b>if not F</b> )	Violation?	Flow End	tering Div	Exhibit 1 10 erge Influe Max De Exhibit 13-8	nce Area sirable on (if not	Violation
V <sub>R12</sub> Level of Serv D <sub>R</sub> = 5.475	Actual 3534 Vice Determ + 0.00734 v R + 0	mfluence A Max Exhibit 13-8 mination (	Desirable 4600:All <b>if not F</b> )	Violation?	V <sub>R</sub> Flow Ent	Actual  Service D  D <sub>R</sub> = 4.252 +	Exhibit 1 10 erge Influe Max De Exhibit 13-8	nce Area sirable on (if not	Violation
V <sub>R12</sub> Level of Serv D <sub>R</sub> = 5.475	Actual 3534 Vice Determ + 0.00734 v R + 0	mfluence A Max Exhibit 13-8 mination (	Desirable 4600:All <b>if not F</b> )	Violation?	V <sub>R</sub> Flow Ent	tering Div	Exhibit 1 10 erge Influe Max De Exhibit 13-8	nce Area sirable on (if not	Violation
Flow Entering $V_{R12}$ Level of Servation $D_R = 5.475$ $D_R = 24.0 \text{ (pc/r)}$	Actual 3534 vice Determ + 0.00734 v R + (mi/ln)	mfluence A Max Exhibit 13-8 mination (	Desirable 4600:All <b>if not F</b> )	Violation?	V <sub>R</sub> Flow Entrol V <sub>12</sub> Level of  D <sub>R</sub> = (pe	Actual  Service D  D <sub>R</sub> = 4.252 +	Exhibit 1 10 erge Influe Max De Exhibit 13-8	nce Area sirable on (if not	Violation
Flow Entering $V_{R12}$ Level of Servation $D_R = 5.475$ $D_R = 24.0 \text{ (pc/n)}$ $OS = C \text{ (Exhibit)}$	Actual 3534  Vice Determ + 0.00734 v R + (mi/ln) t 13-2)	mfluence A Max Exhibit 13-8 mination (	Desirable 4600:All <b>if not F</b> )	Violation?	V <sub>R</sub> Flow Ent  V <sub>12</sub> Level of  D <sub>R</sub> = (pollows = (E)	Actual  Service D D R = 4.252 + c/mi/ln)	Exhibit 1.10  erge Influe  Max De  Exhibit 13-8  etermination  0.0086 V <sub>12</sub> - 6	nce Area sirable on (if not	Violation
Flow Entering $V_{R12}$ Level of Servation $D_R = 5.475$ $D_R = 24.0 \text{ (pc/r)}$ $OS = C \text{ (Exhibit)}$ Speed Determines	Actual 3534 Vice Determ + 0.00734 v R + 0 mi/ln) t 13-2) mination	mfluence A Max Exhibit 13-8 mination (	Desirable 4600:All <b>if not F</b> )	Violation?	V <sub>R</sub> Flow Ent  V <sub>12</sub> Level of  D <sub>R</sub> = (po  LOS = (E  Speed D	Actual  Service D  O <sub>R</sub> = 4.252 + c/mi/ln)  xhibit 13-2)	Exhibit 1.10  erge Influe  Max De  Exhibit 13-8  etermination  0.0086 V <sub>12</sub> - 6	nce Area sirable on (if not	Violation
Flow Entering $V_{R12}$ Level of Servators $D_R = 5.475 \cdot D_R = 24.0 \text{ (pc/n} \cdot D_R = 24.0 \text{ (pc/n} \cdot D_R = 0.385 \text{ (Exhibit)}$ Speed Determine the servators of the ser	Actual 3534  Vice Determ + 0.00734 v R + 0  mi/ln) t 13-2)  mination  kibit 13-11)	mfluence A Max Exhibit 13-8 mination (	Desirable 4600:All <b>if not F</b> )	Violation?	V <sub>R</sub> Flow Entrol V <sub>12</sub> Level of  D <sub>R</sub> = (pol LOS = (E)  Speed D D <sub>s</sub> = (E)	Actual  Service D  D  R = 4.252 + c/mi/ln)  xhibit 13-2)  Seterminat  xhibit 13-12)	Exhibit 1 10  erge Influe  Max De  Exhibit 13-8  etermination  ion	nce Area sirable on (if not	Violation
Flow Entering $V_{R12}$ Level of Servant D <sub>R</sub> = 5.475 · 0 · 0 · 0 · 0 · 0 · 0 · 0 · 0 · 0 ·	Actual 3534  Vice Determ + 0.00734 v R + 0  mi/ln) t 13-2)  mination (sibit 13-11)	mfluence A Max Exhibit 13-8 mination (	Desirable 4600:All <b>if not F</b> )	Violation?	V <sub>R</sub> Flow Ent  V <sub>12</sub> Level of  D <sub>R</sub> = (po  LOS = (E)  Speed D  D <sub>s</sub> = (E)  S <sub>R</sub> = mp	Actual  Service D  O <sub>R</sub> = 4.252 + c/mi/ln) xhibit 13-2) eterminat whibit 13-12) ch (Exhibit 13-1.2)	Exhibit 1 10  erge Influe  Max De  Exhibit 13-8  etermination  ion	nce Area sirable on (if not	Violation
Flow Entering $V_{R12}$ Level of Serva $D_R = 5.475 \cdot 0$ $O_R = 24.0 \text{ (pc/r}$ $O_R = C \text{ (Exhibit)}$ Speed Determine $M_S = 0.385 \text{ (Exhibit)}$ $S_R = 56.2 \text{ mph}$ $S_0 = N/A \text{ mph}$	Actual 3534  Vice Determ + 0.00734 v R + 0  mi/ln) t 13-2)  mination  kibit 13-11)	mfluence A Max Exhibit 13-8 mination (	Desirable 4600:All <b>if not F</b> )	Violation?	V <sub>R</sub> Flow Entrol  V <sub>12</sub> Level of  D <sub>R</sub> = (po LOS = (E Speed D D <sub>S</sub> = (E) S <sub>R</sub> = mp S <sub>0</sub> = mp	Actual  Service D  D  R = 4.252 + c/mi/ln)  xhibit 13-2)  Seterminat  xhibit 13-12)	Exhibit 1 10  erge Influe  Max De Exhibit 13-8  etermination  0.0086 V <sub>12</sub> - 0  ion	nce Area sirable on (if not	Violation

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed Analysis Time Period	AJR Atkins 7/25/2014 AM Peak		Highway/Direction of Trave From/To Jurisdiction Analysis Year	3250-Ri LongPo 2018 Bi	iverLanding to
Project Description Navy	Base ICTF			Site	
✓ Oper.(LOS)			Des.(N)	Plaı	nning Data
Flow Inputs					
Volume, V AADT Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D	2946	veh/h veh/day veh/h	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub> %RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0.90 11 0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub> E <sub>T</sub>	1.00 1.5		$E_R$ $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1.2 1)] 0.948	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance Number of Lanes, N	2	ft	f <sub>LW</sub>		mph mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured) Base free-flow Speed, BFFS	65.0	mph mph	FFS	65.0	mph
LOS and Performanc	e Measures	;	Design (N)		
Operational (LOS) $v_p = (V \text{ or DDHV}) / (PHF \times I)$ $x f_p)$ $S$ $D = v_p / S$ LOS	N x f <sub>HV</sub> 1727 63.5 27.2 D	pc/h/ln mph pc/mi/ln	Design (N) Design LOS $v_p = (V \text{ or DDHV}) / (PHF \text{ x} \text{ x } f_p)$ S $D = v_p / S$ Required Number of Lanes		pc/h/ln mph pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed DDHV - Directional design	BFFS - Ba		$E_R$ - Exhibits 11-10, 11-12 $E_T$ - Exhibits 11-10, 11-11, $f_p$ - Page 11-18 LOS, S, FFS, $v_p$ - Exhibits 11-3	11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed Analysis Time Period	AJR Atkins 7/25/2014 PM Peak		Highway/Direction of Trave From/To Jurisdiction Analysis Year	3250-Ri LongPo	iverLanding to
Project Description Navy	Base ICTF			Cito	
✓ Oper.(LOS)			Des.(N)	Pla	nning Data
Flow Inputs					
Volume, V AADT Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D	3017	veh/h veh/day veh/h	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub> %RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0.90 11 0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub> E <sub>T</sub>	1.00 1.5		$E_R$ $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1.2 1)] 0.948	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft	<u> </u>		
Rt-Side Lat. Clearance		ft	f <sub>LW</sub>		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured) Base free-flow Speed, BFFS	65.0	mph mph	FFS	65.0	mph
LOS and Performanc	e Measures	3	Design (N)		
Operational (LOS)  v <sub>p</sub> = (V or DDHV) / (PHF x   x f <sub>p</sub> ) S D = v <sub>p</sub> / S LOS	N x f <sub>HV</sub> 1768 63.1 28.0 D	pc/h/ln mph pc/mi/ln	Design (N) Design LOS $v_p = (V \text{ or DDHV}) / (PHF \text{ x} \text{ x } f_p)$ S $D = v_p / S$ Required Number of Lanes		pc/h/ln mph pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed DDHV - Directional design	BFFS - Ba		$E_R$ - Exhibits 11-10, 11-12 $E_T$ - Exhibits 11-10, 11-11, $f_p$ - Page 11-18 LOS, S, FFS, $v_p$ - Exhibits 11-3	11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1

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		RAMP	S AND RAN	IP JUNCTI	ONS WC	RKS	HEET			
General In	formation			Site Infor						
Analyst	AJR		F	reeway/Dir of Tr	avel	I-526 E				
Agency or Comp	any Atkin	ns		unction		3260-E	EB Off to Lo	ong Point		
Date Performed		/2014	-	urisdiction						
Analysis Time Pe			A	nalysis Year		2018 E	Build - Rive	Center Site		
Project Description Inputs	on Navy Base IC	l F								
•		Erooway Num	nber of Lanes, N	2						
Upstream A	dj Ramp	1 '							Downstrea	am Adj
□Yes	□On	Ramp Numbe	•	1					Ramp	
		1	Lane Length, L <sub>A</sub>						Yes	On
✓ No	Off	1	Lane Length L <sub>D</sub>	225					☑ No	Off
	_	Freeway Volu		2946						ft
L <sub>up</sub> =	ft	Ramp Volume	13	1089					L <sub>down</sub> =	IL
V,, =	veh/h		e-Flow Speed, $S_{FF}$	65.0					V <sub>D</sub> =	veh/h
<b>v</b> u	VCII/II	Ramp Free-F	low Speed, S <sub>FR</sub>	45.0						
Conversio	n to pc/h Un	der Base	Conditions							
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		$f_{HV}$	f <sub>p</sub>	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>
Freeway	2946	0.90	Level	11	0	0	.948	1.00	34	53
Ramp	1089	0.90	Level	23	0	0	.897	1.00	13	49
UpStream						_				
DownStream		Merge Areas						 Diverge Areas		
Estimation		Merge Areas			Estimat	ion o	of V.	olverge Areas		
		(D )						\/ · (\/ \)	' \D	
	$V_{12} = V_F$		10 =)					= V <sub>R</sub> + (V <sub>F</sub> - V		
-EQ =		ation 13-6 or			L <sub>EQ</sub> =			Equation 13-		
P <sub>FM</sub> =	_	Equation (	EXNIDIT 13-6)		P <sub>FD</sub> =			000 using Eq	uation (Exhi	bit 13-7)
/ <sub>12</sub> =	pc/h				V <sub>12</sub> =			153 pc/h		
V <sub>3</sub> or V <sub>av34</sub>			3-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>			pc/h (Equati	on 13-14 or	13-17)
	2,700 pc/h? Ye					• •		☐ Yes ☑ No		
	1.5 * V <sub>12</sub> /2		10 10 10		"			☐Yes ☑ No	10 10 10	10 10
f Yes,V <sub>12a</sub> =	pc/n ( 13-19)		3-16, 13-18, or		If Yes,V <sub>12a</sub> =	=		oc/h (Equatior 9)	1 13-16, 13-	-18, or 13-
Capacity C		/			Capacit	v Ch		- /		
	Actual		Capacity	LOS F?			Actual	Ca	apacity	LOS F
					V <sub>F</sub>		3453	Exhibit 13-	8 4700	No
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$	- V <sub>D</sub>	2104	Exhibit 13-	8 4700	No
. 0					V <sub>R</sub>		1349	Exhibit 13-1	10 2100	No
Flow Enter	ring Merge In	nfluence 4	\rea	<u> </u>				rge Influer		1
.on Emer	Actual		Desirable	Violation?		_	Actual	Max Desira		Violation
V <sub>R12</sub>		Exhibit 13-8			V <sub>12</sub>	$\neg$	3453	Exhibit 13-8	4400:All	No
	ervice Detern		if not F)	1		f Ser	vice De	terminatio		<del> </del> F)
	+ 0.00734 v <sub>R</sub> +				+			.0086 V <sub>12</sub> - 0		<u> </u>
O <sub>R</sub> = (pc/m		12	A		1		:/mi/ln)	12	U	
	bit 13-2)				l ''		bit 13-2)			
	ermination				Speed L	•		on		
			<del>  '                                   </del>							
•	it 13-11)									
	Exhibit 13-11)				1 " ' '					
	Exhibit 13-11)				$S_0$ = N/A mph (Exhibit 13-12) S = 55.4 mph (Exhibit 13-13)					
. ,	Exhibit 13-13)				I			· · · · · · · · · · · · · · · · · · ·		
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		RAMP	S AND RAM	IP JUNCTI	ONS WC	RKS	HEET			
General In:	formation			Site Infor	mation					
Analyst	AJR		F	reeway/Dir of Tr	avel	I-526 E	В			
Agency or Comp	any Atkin	IS		unction		3260-E	B Off to Lo	ong Point		
Date Performed		/2014	-	urisdiction						
Analysis Time Pe			A	nalysis Year		2018 E	Build - Rive	r Center Site		
	on Navy Base IC	l F								
nputs		Erooway Num	har of Lanca N	2						
Upstream A	dj Ramp	1	ber of Lanes, N						Downstrea	ım Adj
□Yes	□On	Ramp Numbe	•	1					Ramp	
		1	ane Length, L <sub>A</sub>						□Yes	On
✓ No	Off	Deceleration L	ane Length L <sub>D</sub>	225					☑ No	Off
		Freeway Volu	me, V <sub>F</sub>	3017						
L <sub>up</sub> =	ft	Ramp Volume	, V <sub>R</sub>	1167					L <sub>down</sub> =	ft
1.7		Freeway Free	-Flow Speed, S <sub>FF</sub>	65.0					V <sub>D</sub> =	veh/h
$V_u =$	veh/h	Ramp Free-Fl	ow Speed, S <sub>ER</sub>	45.0					v <sub>D</sub> –	VCII/II
Conversio	n to pc/h Un	der Base (	Conditions							
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	$\top$	f <sub>HV</sub>	f <sub>p</sub>	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>
Freeway	3017	0.90	Level	11	0	0.	.948	1.00	35	37
Ramp	1167	0.90	Level	19	0	0.	.913	1.00	14:	20
UpStream										
DownStream										
- 4: 4:		Merge Areas			F = 45 = 4	·	<u> </u>	Diverge Areas		
Estimation	1 of V <sub>12</sub>				Estimat	ion c				
	$V_{12} = V_{F}$	(P <sub>FM</sub> )					V <sub>12</sub> =	$V_R + (V_F - V_F)$	R)P <sub>FD</sub>	
- <sub>EQ</sub> =	(Equa	ation 13-6 or	13-7)		L <sub>EQ</sub> =		(	Equation 13-1	2 or 13-13	)
FM =	using	Equation (E	Exhibit 13-6)		P <sub>FD</sub> =		1.	000 using Equ	uation (Exhil	bit 13-7)
/ <sub>12</sub> =	pc/h				V <sub>12</sub> =		3	537 pc/h		
$V_3$ or $V_{av34}$	pc/h (	Equation 13	-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>		0	pc/h (Equation	n 13-14 or	13-17)
	2,700 pc/h? ☐ Ye	s 🗌 No			Is V <sub>3</sub> or V <sub>av</sub>	, <sub>34</sub> > 2,7	'00 pc/h? [	☐Yes ☑ No		
	1.5 * V <sub>12</sub> /2					•		☐Yes ☑ No		
f Yes,V <sub>12a</sub> =	pc/h (	Equation 13	-16, 13-18, or		If Yes,V <sub>12a</sub> :	-		c/h (Equation	13-16, 13-	18, or 13
	13-19	)						9)		
Capacity C	_	T -		1	Capacit	y Ch	1			1
	Actual	C	apacity	LOS F?			Actual		pacity	LOS F
				1	V <sub>F</sub>		3537	Exhibit 13-8		No
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$	- V <sub>R</sub>	2117	Exhibit 13-8	3 4700	No
					$V_R$		1420	Exhibit 13-1	0 2100	No
low Enter	ring Merge In	ifluence A	rea		Flow Er	nterin	g Dive	rge Influen		
	Actual	Max	Desirable	Violation?			Actual	Max Desirat	ole	Violation
$V_{R12}$		Exhibit 13-8			V <sub>12</sub>		3537	Exhibit 13-8	4400:All	No
evel of Se	ervice Deterr	nination (i	if not F)		Level of	f Ser	vice De	terminatio	n (if not l	F)
$D_R = 5.475$	+ 0.00734 v <sub>R</sub> +	0.0078 V <sub>12</sub> -	0.00627 L <sub>A</sub>			D <sub>R</sub> = 4	1.252 + 0	.0086 V <sub>12</sub> - 0.	009 L <sub>D</sub>	
$D_{R} = (pc/m)$	ni/ln)						/mi/ln)			
	bit 13-2)				l		bit 13-2)			
	ermination				Speed L			on		
<u> </u>	it 13-11)		<del>  '</del>							
•	•		$D_s = 0.426$ (Exhibit 13-12) $S_R = 55.2$ mph (Exhibit 13-12)							
								· ·		
		$S_0$ = N/A mph (Exhibit 13-12) S = 55.2 mph (Exhibit 13-13)								
	Exhibit 13-13)									
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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	T	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>I-526 El</i>	
Agency or Company	Atkins		From/To	3265-Lc	ongPt Off to
Date Performed	7/25/2014		Jurisdiction	LongPtV	WB On
Analysis Time Period	AM Peak		Analysis Year	2018 Βι Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			es.(N)	Plar	nning Data
Flow Inputs					
Volume, V	1857	veh/h	Peak-Hour Factor, PHF	0.90	
AADT		veh/day	%Trucks and Buses, $P_T$	11	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length	Level mi	
DDITV = AADT X K X D		VEII/II	Up/Down %	1111	
Calculate Flow Adjus	tments				
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] <i>0.948</i>	
Speed Inputs			Calc Speed Adj and		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		•
FFS (measured)	65.0	mph	1	05.0	mph
Base free-flow Speed,	00.0	·	FFS	65.0	mph
BFFS		mph			
LOS and Performanc	e Measures	3	Design (N)		
Operational (LOC)			Design (N)		
Operational (LOS)	N v f		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x)$	1088 HV	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	$N \times f_{HV}$	20/b/lp
x f <sub>p</sub> )	65.0		x f <sub>p</sub> )		pc/h/ln
S D = / C	65.0	mph	s		mph
$D = v_p / S$	16.7	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	В		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed	E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens	ity	$E_{\rm T}$ - Exhibits 11-10, 11-11,		f <sub>LC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate	FFS - Free	e-flow speed	<b>!</b> '	11-10	20
LOS - Level of service		se free-flow	f <sub>p</sub> - Page 11-18	11.0	TRD - Page 11-11
speed			LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-∠,	
DDHV - Directional design	hour volume		11-3		

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed Analysis Time Period	AJR Atkins 7/25/2014 PM Peak		Highway/Direction of Trave From/To Jurisdiction Analysis Year	3265-Lo LongPt\	ongPt Off to
Project Description Navy	Base ICTF			Cito	
✓ Oper.(LOS)			Des.(N)	□Plar	nning Data
Flow Inputs					
Volume, V AADT Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D	1850	veh/h veh/day veh/h	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub> %RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0.90 11 0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub> E <sub>T</sub>	1.00 1.5		$E_R$ $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1.2 1)] 0.948	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft	,		
Rt-Side Lat. Clearance		ft	f <sub>LW</sub>		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured) Base free-flow Speed, BFFS	65.0	mph mph	FFS	65.0	mph
LOS and Performanc	e Measures	<del></del>	Design (N)		
Operational (LOS)  v <sub>p</sub> = (V or DDHV) / (PHF x l x f <sub>p</sub> ) S D = v <sub>p</sub> / S LOS	N x f <sub>HV</sub> 1084 65.0 16.7 B	pc/h/ln mph pc/mi/ln	Design (N) Design LOS $v_p = (V \text{ or DDHV}) / (PHF \text{ x} \text{ x } f_p)$ S $D = v_p / S$ Required Number of Lanes		pc/h/ln mph pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed DDHV - Directional design	BFFS - Ba		$E_R$ - Exhibits 11-10, 11-12 $E_T$ - Exhibits 11-10, 11-11, $f_p$ - Page 11-18 LOS, S, FFS, $v_p$ - Exhibits 11-3	11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1

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	RA	MPS AND	RAMP JUNG	CTIONS W	ORKSHF	ET					
General Info		O AIID	0011	Site Infor		· <del>- ·</del>					
Analyst	AJR		Fre	eeway/Dir of Tr		-526 EB					
Agency or Compar	ny Atkin	ns	Ju	nction	3	3270-EB On from	Long Point WB				
Date Performed	7/25	/2014	Ju	risdiction							
Analysis Time Peri			An	nalysis Year	2	2018 Build - Rive	Center Site				
Project Description	Navy Base IC	TF									
nputs		L									
Jpstream Adj Ram	p	1	per of Lanes, N	2				Downstre	am Adj		
	<b>.</b> .	Ramp Number	of Lanes, N	1				Ramp			
Yes C	n	Acceleration L	ane Length, L <sub>A</sub>	925				□Yes	On		
✓ No 🔲 C	)ff	Deceleration L	ane Length L <sub>D</sub>					✓ No	□ <b>0</b> #		
		Freeway Volur	ne, V <sub>F</sub>	1857				INO	Off		
<sub>rup</sub> = ft		Ramp Volume	, V <sub>D</sub>	471				L <sub>down</sub> =	ft		
		1	Flow Speed, S <sub>FF</sub>	65.0				. ,			
$v_{\rm u} = {\rm veh}$	/h	Ramp Free-Flo		25.0				V <sub>D</sub> =	veh/h		
Conversion	to nc/h Hn		111	20.0							
	V V				1 0/5	1 ,	,	\ //DLIF			
(pc/h)	(Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	f <sub>p</sub>	V = V/PHF	$= x f_{HV} x f_{p}$		
Freeway	1857	0.90	Level	11	0	0.948	1.00	2	2177		
Ramp	471	0.90	Level	6	0	0.971	1.00		539		
JpStream											
DownStream		<u> </u>			-		N' A				
Merge Areas Estimation of v <sub>12</sub>					Estimation	on of v	Diverge Areas				
-sumation (					LSuman						
	$V_{12} = V_{F}$	(P <sub>FM</sub> )					$V_R + (V_F - V_R)$				
EQ =	(Equ	ation 13-6 or	13-7)		L <sub>EQ</sub> =		(Equation 13-	12 or 13-1	3)		
P <sub>FM</sub> =	1.000	using Equati	on (Exhibit 13-6)		P <sub>FD</sub> =		using Equatio	n (Exhibit 1	3-7)		
′ <sub>12</sub> =	2177	pc/h			V <sub>12</sub> =		pc/h				
′ <sub>3</sub> or V <sub>av34</sub>	0 pc/	h (Equation 1	3-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>		pc/h (Equation 1	3-14 or 13-1	7)		
Is V <sub>3</sub> or V <sub>av34</sub> > 2,7						<sub>4</sub> > 2,700 pc/h? [	∃Yes ⊟ No				
Is V <sub>3</sub> or V <sub>av34</sub> > 1.5						· <sub>4</sub> > 1.5 * V <sub>12</sub> /2 [					
Yes,V <sub>12a</sub> =			-16, 13-18, or		1		pc/h (Equatio	n 13-16, 1	3-18, or		
	13-19				If Yes,V <sub>12a</sub> =	1	3-19)				
Capacity Ch	W.			•	Capacity						
	Actual	C	apacity	LOS F?	.,	Actual		acity	LOS F?		
					V <sub>F</sub>		Exhibit 13-8	3			
$V_{FO}$	2716	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>	Exhibit 13-8	3			
. 0					V <sub>R</sub>		Exhibit 13	-			
		- fl A				(i Di	10				
low Enterin				\/iolotion?	Flow Ent	tering Dive					
	Actual 2716	Exhibit 13-8	Desirable 4600:All	Violation? No	\/	Actual	Max Desi Exhibit 13-8	rable	Violation?		
V <sub>R12</sub>				INO	V <sub>12</sub>	Comiso Do		<i>(:f</i> 4	<u></u>		
Level of Ser					+	Service De			<i>F)</i>		
**	+ 0.00734 v <sub>R</sub> +	0.0078 V <sub>12</sub> - 0.0	0627 L <sub>A</sub>		L	$O_{R} = 4.252 + 0$	.0086 V <sub>12</sub> - 0.	.009 L <sub>D</sub>			
1 - 20 C (no.	$D_{R} = 20.6 \text{ (pc/mi/ln)}$					c/mi/ln)					
	OS = C (Exhibit 13-2)					xhibit 13-2)					
		peed Determination					LOS = (Exhibit 13-2)  Speed Determination				
.OS = C (Exhib					Speeu D	<del>ctci iiiiiiati</del> c	<del> </del>				
OS = C (Exhib	rmination				<del>                                     </del>						
OS = C (Exhib Speed Deter 1 <sub>S</sub> = 0.334 (E	rmination (xibit 13-11)				$D_s = (Ex$						
OS = C (Exhibition (Exhibition)) (Exhibition) (Exhibit	rmination (xibit 13-11) (Exhibit 13-11)				$D_s = (Ex S_R = mp)$	khibit 13-12)					
OS = C (Exhib Speed Determined M <sub>S</sub> = 0.334 (E $S_R$ = 57.3 mpl $S_0$ = N/A mph	rmination (xibit 13-11)				$D_s = (Ex S_R = mp) $ $S_0 = mp) $	khibit 13-12) h (Exhibit 13-12)					

		RAI	MPS AND	RAMP JUN	CTIONS W	ORKSHI	EET				
General In	nforn		<del>• AIID</del>	0011	Site Infor						
Analyst		AJR		Fr	reeway/Dir of Tr		I-526 E	 B			
Agency or Com	npany	Atkins	S	Ju	ınction		3270-E	B On from L	ong Point WB		
Date Performed	d	7/25/2	2014	Jι	urisdiction						
Analysis Time F		PM P		Aı	nalysis Year		2018 B	uild - River (	Center Site		
Project Descrip	tion N	lavy Base ICT	F								
nputs			1								
Jpstream Adj R	Ramp		1	ber of Lanes, N	2					Downstre	am Adj
	٦.		Ramp Number	r of Lanes, N	1					Ramp	
Yes	On		Acceleration L	ane Length, L <sub>A</sub>	925					□Yes	On
✓ No	Off		Deceleration L	ane Length L <sub>D</sub>							_
	_ 0		Freeway Volui	me, V <sub>E</sub>	1850					✓ No	Off
<sub>rup</sub> = 1	ft		Ramp Volume		471					L <sub>down</sub> =	ft
				Flow Speed, S <sub>FF</sub>	65.0						
/ <sub>u</sub> = v	/eh/h		1	ow Speed, S <sub>FR</sub>	25.0					$V_D =$	veh/h
20 00 10 10	4-	no/b		111	23.0						
onversio	on to	pc/n Und		Conditions		1	1				
(pc/h)		(Veh/hr)	PHF	Terrain	%Truck	%Rv	'	f <sub>HV</sub>	f <sub>p</sub>	v = V/PHI	$F \times f_{HV} \times f_{p}$
Freeway		1850	0.90	Level	11	0	0.9	948	1.00	:	2169
Ramp		471	0.90	Level	5	0	0.9	976	1.00		536
JpStream											
DownStream											
Merge Areas								Di	verge Areas		
stimatio	n of	V <sub>12</sub>				Estimat	ion o	f v <sub>12</sub>			
		V <sub>12</sub> = V <sub>F</sub>	(P <sub>FM</sub> )					V <sub>12</sub> = V	R + (V <sub>F</sub> - V <sub>R</sub> )	)P <sub>FD</sub>	
- <sub>EQ</sub> =		(Equa	ation 13-6 or	13-7)		L <sub>EQ</sub> =		 (E	Equation 13-	12 or 13-1	13)
P <sub>FM</sub> =				ion (Exhibit 13-6)	)	P <sub>FD</sub> =			ing Equatio		
' <sub>12</sub> =		2169		(		V <sub>12</sub> =			c/h	(	- /
$V_3$ or $V_{av34}$				13-14 or 13-17)	١	V <sub>3</sub> or V <sub>av34</sub>			c/h (Equation 1	3_14 or 13_4	17)
s V <sub>3</sub> or V <sub>av34</sub> >	> 2 700			10-14-01-10-17	/		> 2.70		Yes No	0 14 01 10	''',
ls V <sub>3</sub> or V <sub>av34</sub> >									Yes No		
	- 1.5 \			3-16, 13-18, or					res ⊟ No c/h (Equatior	n 13₋16 1	3_18 or
Yes,V <sub>12a</sub> =		13-19)		7-10, 10-10, 01		If Yes,V <sub>12a</sub> =	•		.19)	1 13-10, 1	J-10, OI
Capacity	Chec	ks				Capacit	y Che	ecks			
		Actual	С	apacity	LOS F?			Actual	Сар	acity	LOS F?
						V <sub>F</sub>			Exhibit 13-8	3	
$V_{FO}$		2705	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>D</sub>		Exhibit 13-8	3	
*FO		2100	LAHIDIC 13-0		INO				Exhibit 13-		
						V <sub>R</sub>			10		
low Ente	ering	Merge In	fluence A	rea		Flow En	terin	g Diverg	ge Influen	ce Area	1
		Actual	Max I	Desirable	Violation?		P	ctual	Max Desi	rable	Violation?
$V_{R12}$		2705	Exhibit 13-8	4600:AII	No	V <sub>12</sub>			Exhibit 13-8		
evel of S	Servio	e Detern	nination (i	if not F)		Level of	Serv	rice Det	erminatio	n (if not	<i>F</i> )
D <sub>R</sub> = 5.4	475 + 0	.00734 v <sub>R</sub> + 0	0.0078 V <sub>12</sub> - 0.0	00627 L <sub>A</sub>			D <sub>R</sub> = 4	.252 + 0.0	086 V <sub>12</sub> - 0.	009 L <sub>D</sub>	
	(pc/mi/l					L	c/mi/lr			_	
LOS = C (Exhibit 13-2)						1	Exhibit	,			
Speed De						Speed L			1		
						<del>  '                                   </del>			1		
•		t 13-11)					xhibit 1				
		xhibit 13-11)				1 .,		ibit 13-12)			
		khibit 13-11)				S <sub>0</sub> = mph (Exhibit 13-12)					
5 = 57.3	mph (E	xhibit 13-13)				S = mph (Exhibit 13-13)					
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	RA	MPS AND	RAMP JUNG	CTIONS W	ORKSHE	EET			
General Info		<b>3</b> 7 11 13		Site Infor					
Analyst	AJR		Fr	eeway/Dir of Tr		I-526 EB			
Agency or Company	y Atkin	IS	Ju	nction		3280-EB On fro	m Long Point EB		
Date Performed		/2014		risdiction					
Analysis Time Perio			Ar	alysis Year		2018 Build - Riv	ver Center Site		
Project Description	Navy Base IC	TF							
nputs		le						_	
Jpstream Adj Ramp	)	1	per of Lanes, N	2				Downstre	am Adj
	_	Ramp Number		1				Ramp	
Yes O	n	Acceleration L	ane Length, L <sub>A</sub>	625				□Yes	On
✓ No 🗆 O	ff	Deceleration L	ane Length L <sub>D</sub>					✓No	Off
		Freeway Volur	ne, V <sub>F</sub>	2328				NO	
<sub>rup</sub> = ft		Ramp Volume	, V <sub>R</sub>	345				L <sub>down</sub> =	ft
			Flow Speed, S <sub>FF</sub>	65.0					I- /I-
$t_{\rm u}' = {\rm veh/h}$	n	Ramp Free-Flo		45.0				V <sub>D</sub> =	veh/h
Conversion t	to nc/h lln		111	10.0					
	∨			0/ Truels	0/ D. /		f	V = V/DH	Evf vf
(pc/h)	(Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	f <sub>p</sub>	V = V/PHI	F x f <sub>HV</sub> x f <sub>p</sub>
Freeway	2328	0.90	Level	11	0	0.948	1.00		2729
Ramp	345	0.90	Level	20	0	0.909	1.00		422
JpStream									
DownStream		Marra Arasa					Diverse Areas		
Merge Areas Estimation of v <sub>12</sub>					Fetimati	ion of v <sub>12</sub>	Diverge Areas		
-Stimation o					LStillati				
	$V_{12} = V_{F}$					V <sub>12</sub> :	$= V_R + (V_F - V_F)$		
EQ =	(Equ	ation 13-6 or	13-7)		L <sub>EQ</sub> =		(Equation 13-	-12 or 13-1	13)
P <sub>FM</sub> =	1.000	using Equati	on (Exhibit 13-6)		P <sub>FD</sub> =		using Equation	on (Exhibit 1	3-7)
′ <sub>12</sub> =	2729	pc/h			V <sub>12</sub> =		pc/h		
′ <sub>3</sub> or V <sub>av34</sub>	0 pc/	h (Equation 1	3-14 or 13-17)		$V_3$ or $V_{av34}$		pc/h (Equation	13-14 or 13-	17)
ls V <sub>3</sub> or V <sub>av34</sub> > 2,70	00 pc/h? Ye	s 🗹 No			Is V <sub>3</sub> or V <sub>av3</sub>	<sub>34</sub> > 2,700 pc/h?	Yes No		
ls V <sub>3</sub> or V <sub>av34</sub> > 1.5	* V <sub>12</sub> /2 □ Ye	s 🗹 No			Is V <sub>3</sub> or V <sub>av3</sub>	3 <sub>4</sub> > 1.5 * V <sub>12</sub> /2	☐Yes ☐ No		
Yes,V <sub>12a</sub> =			-16, 13-18, or		If Yes,V <sub>12a</sub> =		pc/h (Equation		3-18, or
	13-19)	)					13-19)		
Capacity Ch				1	Capacity	y Checks			1
	Actual	C	apacity	LOS F?	\ \	Actua		pacity	LOS F?
					V <sub>F</sub>		Exhibit 13-		
$V_{FO}$	3151	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>	Exhibit 13-	-8	
					V <sub>R</sub>		Exhibit 13	3-	
Janu Frataria	- Marra 1	-fl A				to vivo v. Div	10		
Flow Enterin	Actual		<b>rea</b> Desirable	Violation?	FIOW EN	Actual	erge Influer Max Des		Violation?
V <sub>R12</sub>	3151	Exhibit 13-8	4600:All	No	V <sub>12</sub>	Actual	Exhibit 13-8	lable	VIOIALIOITE
Level of Serv				INU		Convine D	etermination	n /if not	
_ever or serv									. <i>F)</i>
	+ 0.00734 V <sub>R</sub> + 1	0.0076 V <sub>12</sub> - 0.0	0627 L <sub>A</sub>		1		0.0086 V <sub>12</sub> - 0	1.009 L <sub>D</sub>	
D <sub>R</sub> = 5.475 +	>					c/mi/ln)			
$D_{R} = 5.475 + 25.9 \text{ (pc/r}$	•								
$D_R = 5.475 + 25.9 \text{ (pc/r}$ $OS = C \text{ (Exhibit)}$	t 13-2)				_	xhibit 13-2)			
$D_{R} = 5.475 + 25.9 \text{ (pc/r}$	t 13-2)				_	eterminat	ion		
$D_R = 5.475 + 0.00$ $D_R = 25.9 \text{ (pc/r)}$ $D_R = 25.9 \text{ (pc/r)}$ $D_R = C \text{ (Exhibit)}$ $D_R = 0.475 + 0.00$	t 13-2)				Speed D		ion		
$D_R = 5.475 + 10$ $D_R = 25.9 \text{ (pc/r)}$ $D_R = 25.9 \text{ (pc/r)}$ $D_R = 25.9 \text{ (pc/r)}$ $D_R = 25.475 + 10$ $D_R = 25.475 $	t 13-2) <b>mination</b> (ibit 13-11)				Speed D	Determinat			
$D_{R} = 5.475 + 6.00$ $D_{R} = 25.9 \text{ (pc/r}$ $D_{R} = 25.9 \text{ (pc/r}$ $D_{R} = 0.356 \text{ (Ex.}$	t 13-2)  mination  tibit 13-11)  (Exhibit 13-11)				$\begin{array}{ccc} \textbf{Speed D} \\ \textbf{D}_{s} = & (\textbf{E} \\ \textbf{S}_{R} = & \textbf{mp} \end{array}$	Determinat xhibit 13-12)	2)		
$D_{R} = 5.475 + 6.00$ $D_{R} = 25.9 \text{ (pc/r}$ $D_{R} = 25.475 + 6.00$	t 13-2) <b>mination</b> (ibit 13-11)				<b>Speed D</b> D <sub>s</sub> = (E S <sub>R</sub> = mp S <sub>0</sub> = mp	Determinat xhibit 13-12) ph (Exhibit 13-1	2) 2)		

		RAI	MPS AND	RAMP JUNG	CTIONS W	/ORKSHI	EET				
General li	nformatio		57.115		Site Infor						
Analyst		AJR		Fr	eeway/Dir of Tr		I-526 EB				
Agency or Con		Atkins	S	Ju	nction		3280-EB	On from L	ong Point EB		
Date Performe		7/25/2			risdiction						
Analysis Time		PM P		An	nalysis Year		2018 Buil	d - River C	Center Site		
	ption Navy B	ase ICT	F								
nputs			l								
Jpstream Adj F	Ramp		Freeway Numb		2					Downstre	am Adj
□v [	По-		Ramp Number		1					Ramp	
Yes	☐ On		Acceleration La	ane Length, L <sub>A</sub>	625					□Yes	On
✓ No	Off		Deceleration La	ane Length L <sub>D</sub>						<b>☑</b> No	Off
			Freeway Volun	ne, V <sub>F</sub>	2321					INO INO	
up =	ft		Ramp Volume,	V <sub>D</sub>	667					L <sub>down</sub> =	ft
				Flow Speed, S <sub>FF</sub>	65.0						
/ <sub>u</sub> = \	veh/h		Ramp Free-Flo		45.0					V <sub>D</sub> =	veh/h
Convorci	on to no/	h IInd		Conditions	70.0						
	on to pen					1	Τ,		,	\ //DI II	
(pc/h)	(Vel	n/hr)	PHF	Terrain	%Truck	%Rv	f <sub>H</sub>	V	f <sub>p</sub>	V = V/PHI	$= x f_{HV} x f_{p}$
Freeway	232	21	0.90	Level	11	0	0.94	8	1.00	2	2721
Ramp	66	7	0.90	Level	9	0	0.95	7	1.00		774
JpStream			<u> </u>								
DownStream											
Merge Areas Estimation of v <sub>12</sub>						Estimat	ion of	DIV	erge Areas		
-Sumano						LStillati					
	V	$_{12} = V_{F}$	(P <sub>FM</sub> )						R + (V <sub>F</sub> - V <sub>R</sub>		
EQ =		(Equa	ation 13-6 or	13-7)		L <sub>EQ</sub> =		(E	quation 13-	12 or 13-1	3)
<sub>FM</sub> =		1.000	using Equation	on (Exhibit 13-6)		P <sub>FD</sub> =		us	sing Equatio	n (Exhibit 1	3-7)
′ <sub>12</sub> =	2	2721 p	oc/h			V <sub>12</sub> =		po	:/h		
' <sub>3</sub> or V <sub>av34</sub>	(	0 pc/h	า (Equation 1	3-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>		рс	h (Equation 1	3-14 or 13-1	7)
	> 2,700 pc/h?						<sub>34</sub> > 2,700	pc/h?	Yes No		
	> 1.5 * V <sub>12</sub> /2								Yes No		
Yes,V <sub>12a</sub> =	12			-16, 13-18, or					:/h (Equation	n 13-16, 1	3-18, or
		13-19)				If Yes,V <sub>12a</sub> =		13-			
Capacity					•	Capacit	y Chec		_		
	Ac	tual	Ca	apacity	LOS F?			Actual		acity	LOS F?
						V <sub>F</sub>			Exhibit 13-8	3	
$V_{FO}$	34	95	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>		Exhibit 13-8	3	
. 0						V <sub>R</sub>			Exhibit 13-	-	
-1 <b>-</b>		1	<u> </u>				4	D:	10	4	
-iow Ente			fluence A		Violation?	Flow En	_		ge Influen		
	Act 349		Exhibit 13-8	Desirable 4600:All	Violation? No	\/	Act		Max Desi Exhibit 13-8	rable	Violation?
\/	348				INO	V <sub>12</sub>	· Commi			/:£ a. f	<b>-</b>
V <sub>R12</sub>	Comico D		nination (ii						erminatio		<i>F)</i>
evel of S	Service D		00701/ 00	2021			U <sub>D</sub> = 4.2	52 + 0.0	086 V <sub>12</sub> - 0.	.009 L <sub>D</sub>	
<b>Level of S</b> D <sub>R</sub> = 5.	.475 + 0.00734		0.0078 V <sub>12</sub> - 0.0	0627 L <sub>A</sub>		1				Ь	
Level of S $D_R = 5.$ $D_R = 28.5$	.475 + 0.00734 5 (pc/mi/ln)		0.0078 V <sub>12</sub> - 0.0	0627 L <sub>A</sub>		$D_R = (p$	oc/mi/ln)			D	
Level of S $D_R = 5.$ $D_R = 28.5$	.475 + 0.00734		0.0078 V <sub>12</sub> - 0.0	0627 L <sub>A</sub>		$D_R = (p$		3-2)			
Level of S $D_R = 5.$ $D_R = 28.5$ $D_R = D_R = 0.$	.475 + 0.00734 5 (pc/mi/ln)	4 v <sub>R</sub> + 0	0.0078 V <sub>12</sub> - 0.0	0627 L <sub>A</sub>		$D_R = (p$	oc/mi/ln) Exhibit 1		1		
D <sub>R</sub> = 5. O <sub>S</sub> = 0 (E	.475 + 0.00734 5 (pc/mi/ln) Exhibit 13-2) Exerminati	4 v <sub>R</sub> + 0	0.0078 V <sub>12</sub> - 0.0	0627 L <sub>A</sub>		D <sub>R</sub> = (p LOS = (E <b>Speed L</b>	oc/mi/ln) Exhibit 1	inatior	1		
D <sub>R</sub> = 5. OS = D (E Speed De d <sub>S</sub> = 0.39	.475 + 0.00734 6 (pc/mi/ln) Exhibit 13-2) Exercial (Exhibit 13-1)	1 v <sub>R</sub> + 0	0.0078 V <sub>12</sub> - 0.0	0627 L <sub>A</sub>		D <sub>R</sub> = (p LOS = (E <b>Speed L</b> D <sub>s</sub> = (E	oc/mi/ln) Exhibit 1 Determ	inatior 12)	1		
$D_{R} = 5.0$ $D_{R} = 28.5$ $D_{S} = D (E)$ $D_{S} = 0.39$ $D_{S} = 0.39$	.475 + 0.00734 6 (pc/mi/ln) Exhibit 13-2) etermination (Exhibit 13-14) 9 mph (Exhibit	ion  1) 13-11)	0.0078 V <sub>12</sub> - 0.0	0627 L <sub>A</sub>		$D_R = (p)$ $LOS = (E)$ $Speed L$ $D_S = (E)$ $S_R = m$	oc/mi/ln) Exhibit 1 Determ Exhibit 13-	<b>inatior</b> 12) t 13-12)	1		
$D_{R} = 5.0$ $D_{R} = 28.5$ $D_{S} = D (E_{S})$ $D_{S} = 0.39$	.475 + 0.00734 6 (pc/mi/ln) Exhibit 13-2) Exercial (Exhibit 13-1)	ion  1) 13-11)	0.0078 V <sub>12</sub> - 0.0	0627 L <sub>A</sub>		$D_R$ = (p LOS = (E <b>Speed L</b> $D_S$ = (E $S_R$ = m $S_0$ = m	oc/mi/ln) Exhibit 1 Determ Exhibit 13- ph (Exhibi	ination (2) t 13-12) t 13-12)	1		

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	T	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>I-526 FB</i>	
Agency or Company	Atkins		From/To	3290-	
Date Performed	7/25/2014		Jurisdiction	LongPt.to	bUS17/Hungryneck
Analysis Time Period	AM Peak		Analysis Year	2018 Bui	ld - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plan	ning Data
Flow Inputs					
Volume, V AADT	2673	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 9	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length Up/Down %	Level mi	
Calculate Flow Adjus	tments		- F		
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
<sup>·p</sup>  E <sub>T</sub>	1.5				
·	7.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$		
Speed Inputs			Calc Speed Adj and	FF5	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	65.0	mph	FFS	65.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performanc	e Measures		Design (N)		
			Design (N)		
Operational (LOS)			Design LOS		
v <sub>p</sub> = (V or DDHV) / (PHF x	N x f <sub>HV</sub> 1552	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	pc/h/ln
x f <sub>p</sub> )	64.7	mph	x f <sub>p</sub> )		ролин
D = v <sub>n</sub> / S	24.0	•	S		mph
P P	24.0 C	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	C		Required Number of Lane	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	d			f Eybibit 14.0
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>n</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11	, 11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		se free-flow	f <sub>p</sub> - Page 11-18	44.0	TRD - Page 11-11
speed			LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	
DDHV - Directional design	hour volume		11-3		

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	T	
			Cita Information		
General Information Analyst	AJR		Site Information Highway/Direction of Trave	11 526 ED	
				3290-	
Agency or Company	Atkins		From/To	LongPt.to	OUS17/Hungryneck
Date Performed	7/25/2014		Jurisdiction	2018 Rui	ld - River Center
Analysis Time Period	PM Peak		Analysis Year	Site	ia - Miver Genter
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plar	ning Data
Flow Inputs					
Volume, V	2988	veh/h	Peak-Hour Factor, PHF	0.90	
AADT		veh/day	%Trucks and Buses, P <sub>T</sub>	7	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain:	Level	
DDHV = AADIXKXD		ven/n	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments		<u> </u>		
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R -$	1)] 0.966	
Speed Inputs			Calc Speed Adj and		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f <sub>LW</sub>		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	65.0	mph		05.0	•
Base free-flow Speed,	00.0		FFS	65.0	mph
BFFS		mph			
LOS and Performanc	e Measures	<b>S</b>	Design (N)		
Operational (LOS)			Design (N)		
- (\/ or DDU\/) / (DUE v	NI v f		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x)$	1N X 1 <sub>HV</sub> 1718	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	
x f <sub>p</sub> )			$x f_p$		pc/h/ln
S	63.6	mph	S		mph
$D = v_p / S$	27.0	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	D		Required Number of Lane	s, N	
Glossary			Factor Location	<u> </u>	
N - Number of lanes	S - Spec	ed			f Evhihit 11.0
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>n</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11	, 11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18		TRD - Page 11-11
speed		-	LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	
DDHV - Directional design	hour volume		11-3		
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General In	formation	I AMINI V	S AND RAM	Site Infor						
Analyst		1	г.			1 506 5	D			
Malyst Agency or Comp	AJR			reeway/Dir of Tr unction		1-526 E		247/1 lungun maale		
ate Performed	•	ns 5/2014		urisdiction		3300-E	.D 011 10 U	S17/Hungryneck		
nalysis Time Pe		Peak		nalysis Year		2019 D	uild Divo	Center Site		
	on Navy Base IC		A	ilalysis i cal		20 10 B	uliu - Kivel	Ceriler Sile		
nputs	on Navy Base to	· · · · · · · · · · · · · · · · · · ·								
Upstream A	di Damp	Freeway Num	per of Lanes, N	2					Downstre	am Adi
	_	Ramp Number	of Lanes, N	1					Ramp	amraj
□Yes	□ On	Acceleration L	ane Length, L <sub>A</sub>						□Yes	On
✓ No	Off	Deceleration L	ane Length L <sub>D</sub>	225	5				Off	
	<del></del>	Freeway Volui	ne, V <sub>F</sub>	2673	73					
L <sub>up</sub> =	ft	Ramp Volume	11	1147					L <sub>down</sub> =	ft
V,, =	veh/h		Flow Speed, $S_{\rm FF}$	55.0					V <sub>D</sub> =	veh/h
v <sub>u</sub> –	venin	Ramp Free-Fl	ow Speed, S <sub>FR</sub>	45.0					- D	
Conversio	n to pc/h Un	der Base (	Conditions							
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		$f_{HV}$	f <sub>p</sub>	v = V/PHI	x f <sub>HV</sub> x f <sub>p</sub>
reeway	2673	0.90	Level	9	0	0.	957	1.00	3	104
Ramp	1147	0.90	Level	4	0	0.	980	1.00	1	300
JpStream										
DownStream		Merge Areas								
ctimation		Ectimat	iono		Diverge Areas					
stimation					Estimat	1011 0				
	$V_{12} = V_{F}$							: V <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>	–	
EQ =	(Equ	ation 13-6 or	13-7)		L <sub>EQ</sub> =		(	Equation 13-1	2 or 13-1	3)
FM =	using	g Equation (E	xhibit 13-6)		P <sub>FD</sub> =		1.	000 using Equ	uation (Ext	nibit 13-7)
12 =	pc/h				V <sub>12</sub> =		3′	104 pc/h		
<sub>3</sub> or V <sub>av34</sub>	pc/h	(Equation 13-	14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>		0	pc/h (Equation	n 13-14 c	r 13-17)
	2,700 pc/h? ☐ Y∈					<sub>24</sub> > 2,7		Yes ☑ No		,
	1.5 * V <sub>12</sub> /2  \( \text{Y}\) Y\epsilon							Yes ☑ No		
0 0.01			-16, 13-18, or					c/h (Equation	13-16. 13	3-18. or 13
Yes,V <sub>12a</sub> =	13-19	: •			If Yes,V <sub>12a</sub> =	=		9)		
Capacity C	hecks				Capacit	y Ch	ecks			
	Actual	C	apacity	LOS F?	.,		Actual		pacity	LOS F
					V <sub>F</sub>		3104	Exhibit 13-8	-	No
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$	- V <sub>R</sub>	1804	Exhibit 13-8	4500	No
					$V_R$		1300	Exhibit 13-1	2100	No
low Enter	ring Merge lı	nfluence A	rea		Flow En	terin	g Dive	rge Influen		
	Actual		Desirable	Violation?		1	Actual	Max Desirab	le	Violation
V <sub>R12</sub>		Exhibit 13-8			V <sub>12</sub>	3	3104	Exhibit 13-8	4400:All	No
	ervice Deteri				Level of	Serv	vice De	terminatio	n (if not	F)
$D_R = 5.475 -$	+ 0.00734 v <sub>R</sub> +	0.0078 V <sub>12</sub> -	0.00627 L <sub>A</sub>			$D_R = 4$	1.252 + 0	.0086 V <sub>12</sub> - 0.0	009 L <sub>D</sub>	
<sub>R</sub> = (pc/m	ni/ln)				$D_R = 28$	3.9 (pc/	/mi/ln)			
OS = (Exhi	bit 13-2)				LOS = D	(Exhib	oit 13-2)			
Speed Det	ermination				Speed L	•		on		
					<del>  '                                   </del>		xhibit 13			
10 = (Fyih						S <sub>R</sub> = 49.6 mph (Exhibit 13-12)				
	Eyhihit 13 11\				$ S_D  = 40$	יונוווון ט.כ		10-12-1		
<sub>R</sub> = mph (I	Exhibit 13-11)				1		•	*		
$_{\rm R}^{=}$ mph (I mph (I	Exhibit 13-11) Exhibit 13-11) Exhibit 13-13)				$S_0 = N_0$	/A mph	(Exhibit (Exhibit	13-12)		

General In	formation	I APAINII V	S AND RAM	Site Infor						
Analyst	AJR	)		reeway/Dir of Tr		I-526 E	D			
Agency or Comp				unction				S17/Hungryneck		
ate Performed	•	5/2014		urisdiction		3300-L	D OII to ot	5 17/1 luligiyileck		
nalysis Time P		Peak		nalysis Year		2018 Bi	uild - River	Center Site		
	ion Navy Base IC		7 1	naryolo roar		2010 0	ulia Ttivol	CONTON CITO		
nputs										
Upstream A	ıdi Ramn	Freeway Num	ber of Lanes, N	2					Downstre	am Adi
<u>.</u>	_	Ramp Number	of Lanes, N	1					Ramp	amiraj
□Yes	□ On	Acceleration L	ane Length, L <sub>A</sub>						□Yes	On
✓ No	Off	Deceleration L	ane Length L <sub>D</sub>	225	5 ✓ No □					Off
_	_	Freeway Volui	me, V <sub>F</sub>	2988						
L <sub>up</sub> =	ft	Ramp Volume	, V <sub>R</sub>	982					L <sub>down</sub> =	ft
\/ <b>-</b>	le /le	Freeway Free	Flow Speed, S <sub>FF</sub>	55.0					V <sub>D</sub> =	veh/h
$V_u =$	veh/h	Ramp Free-Fle	ow Speed, S <sub>FR</sub>	45.0					D _	VCII/II
onversio	n to pc/h Un	der Base (	Conditions							
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	fp	v = V/PHI	x f <sub>HV</sub> x f <sub>p</sub>
reeway	2988	0.90	Level	7	0	0.9	966	1.00		436
Ramp	982	0.90	Level	4	0		980	1.00		113
JpStream	332	1.00			<u> </u>	+				
DownStream										
		Merge Areas						Diverge Areas		
Estimation of v <sub>12</sub>					Estimat	ion o	f v <sub>12</sub>			
	V <sub>12</sub> = V <sub>F</sub>	( P <sub>EM</sub> )					V <sub>12</sub> =	: V <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>	P <sub>ED</sub>	
Eq = (Equation 13-6 or 13-7)					L <sub>EQ</sub> =			Equation 13-1	–	3)
FM =		g Equation (E			P <sub>FD</sub> =			000 using Equ		
' <sub>12</sub> =	pc/h	) — q (-			V <sub>12</sub> =			136 pc/h	idiloii (Exi	
<sub>3</sub> or V <sub>av34</sub>	•	(Equation 13-	14 or 13 17)		V <sub>3</sub> or V <sub>av34</sub>			pc/h (Equatio	n 12 14 c	r 12 17)
	2,700 pc/h? ☐ Y€		14 01 13-17)			> 2.71			111 13-14 C	13-17)
								☐ Yes ☑ No		
0 0,01	1.5 * V <sub>12</sub> /2  \( \text{Y}\) Ye		-16, 13-18, or					Yes V No oc/h (Equation	12 16 12	10 or 12
Yes,V <sub>12a</sub> =	13-19	· ·	10, 13-10, 01		If Yes,V <sub>12a</sub> =			9)	15-10, 10	J-10, OI 13
Capacity C	Checks	,			Capacit	y Che	ecks	,		
	Actual	C	apacity	LOS F?			Actual	Ca	pacity	LOS F
					V <sub>F</sub>		3436	Exhibit 13-8	4500	No
$V_{FO}$		Exhibit 13-8			V <sub>FO</sub> = V <sub>F</sub>	- V <sub>D</sub>	2323	Exhibit 13-8	4500	No
10					V <sub>R</sub>	IX	1113	Exhibit 13-1		No
low Ento	ring Merge II	nfluonoo A	roo			torin		rge Influen		
TOW LINE	Actual		Desirable	Violation?	FIOW EII	_	Actual	Max Desirab		Violation
V <sub>R12</sub>	/ totual	Exhibit 13-8	20011 00 10	v iolation:	V <sub>12</sub>	_	436	Exhibit 13-8	4400:All	No
	ervice Deteri		f not E)							
								terminatio	•	<u>r)</u>
	+ 0.00734 v <sub>R</sub> +	0.0078 V <sub>12</sub> -	0.0002/ L <sub>A</sub>					.0086 V <sub>12</sub> - 0.	nna r <sup>D</sup>	
$_{R}$ = (pc/m					l ''	1.8 (pc/	,			
`	ibit 13-2)					`	oit 13-2)			
Speed Det	ermination				Speed L					
1	it 13-11)				$D_s = 0.$	398 (E	xhibit 13-	-12)		
•						$S_{R}^{=}$ 49.8 mph (Exhibit 13-12)				
l <sub>S</sub> = (Exib	Exhibit 13-11)				$S_R = 49$	o.o mpn	(EXHIDIT	10-12)		
$I_S = (Exib_R = mph ($	Exhibit 13-11) Exhibit 13-11)				1		(Exhibit	*		
$I_S = (Exib)$ $R = mph($ $0 = mph($	•				$S_0 = N$	/A mph	•	13-12)		

F-3992

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	T	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>I-526 EL</i>	
Agency or Company	Atkins		From/To	3310-U	S17/Hungryneck to
Date Performed	7/25/2014		Jurisdiction	US17	
Analysis Time Period	AM Peak		Analysis Year	2018 Βι Site	uild - River Center
Project Description Navy	Base ICTF			0.10	
✓ Oper.(LOS)			Des.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	1526	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 7	
Peak-Hr Prop. of AADT, K		,	%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments		·		
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
Γ E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$		
Speed Inputs			Calc Speed Adj and		
Lane Width		ft	Caic Speed Adj alid	113	
Rt-Side Lat. Clearance		ft			
Number of Lanes, N	2	п	f <sub>LW</sub>		mph
	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD	55.0	ramps/mi	TRD Adjustment		mph
FFS (measured)	55.0	mph	FFS	55.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performanc	e Measures	 S	Design (N)		
			Design (N)		
Operational (LOS)			Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV 877</sub>	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f	
x f <sub>p</sub> )	011	ролин	$x f_p$	· · · · · HV	pc/h/ln
S	55.0	mph	s 'p'		mph
$D = v_p / S$	15.9	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	В		Required Number of Lanes	s N	ролпілії
Glossary			Factor Location	J, 14	
	- C Cnor		I actor Location		
N - Number of lanes	S - Spee		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
V - Hourly volume	D - Dens	-	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate		e-flow speed	f <sub>p</sub> - Page 11-18		TRD - Page 11-11
LOS - Level of service speed	DFF5 - B6	ase free-flow	LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	
DDHV - Directional design	hour volume		11-3		
	da All Dights Dess				rated: 12/0/2014 0:24 AN

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	3310-US US17	S17/Hungryneck to
Date Performed	7/25/2014		Jurisdiction	0317	
Analysis Time Period	PM Peak		Analysis Year	2018 Bu Site	ıild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	☐ Plar	nning Data
Flow Inputs					
Volume, V AADT	2006	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 6	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length	Level mi	
			Up/Down %		
Calculate Flow Adjus	tments				
f <sub>p</sub>	1.00		$E_R$	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] 0.971	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	55.0	mph	FFS	55.0	mph
Base free-flow Speed, BFFS		mph		00.0	Πρπ
LOS and Performanc	e Measures	<del></del>	Design (N)		
			Design (N)		
Operational (LOS)			Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x   v_f)$	N x f <sub>HV</sub> 1148	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	pc/h/ln
x f <sub>p</sub> ) S	55.0	mnh	x f <sub>p</sub> )		рслілії
	20.9	mph	S		mph
D = v <sub>p</sub> / S LOS	20.9 C	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LO3	C		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed	E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens	ity	$E_{\rm T}$ - Exhibits 11-10, 11-11,		f <sub>LC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate	FFS - Free	e-flow speed	$f_{\rm n}$ - Page 11-18	11-10	
LOS - Level of service	BFFS - Ba	ase free-flow	F	11_2	TRD - Page 11-1
speed	hourvolume		LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	ı ı-∠,	
DDHV - Directional design	riour volume		<u>                                     </u>		

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		RAMP	S AND RAM	IP JUNCTI	ONS WO	RKS	HEET			
General In	formation			Site Infor	mation					
Analyst	AJR		F	reeway/Dir of Tr	avel	I-526 E	В			
Agency or Comp	pany Atkin	IS	J	unction		3320-E	B Off to U	S17 SB		
Date Performed		/2014	-	urisdiction						
Analysis Time P			A	nalysis Year		2018 E	Build - Rive	Center Site		
	ion Navy Base IC	TF								
Inputs		le v								
Upstream A	Adj Ramp	1	ber of Lanes, N	2					Downstrea	ım Adj
		Ramp Numbe	•	1					Ramp	
□Yes	☐ On	Acceleration L	ane Length, L <sub>A</sub>						□Yes	On
✓ No	Off	Deceleration L	ane Length L <sub>D</sub>	250					☑ No	Off
		Freeway Volu	me, V <sub>F</sub>	1526					I № INO	⊔Оп
L <sub>up</sub> =	ft	Ramp Volume	, V <sub>D</sub>	1060					L <sub>down</sub> =	ft
		1	-Flow Speed, S <sub>FF</sub>	55.0						
$V_u =$	veh/h	1	ow Speed, S <sub>FR</sub>	45.0					V <sub>D</sub> =	veh/h
2	40 0 //0 11:0		111	45.0						
Jonversio	n to pc/h Und	der Base (	Conditions	1						
(pc/h)	(Veh/hr)	PHF	Terrain	%Truck	%Rv		$f_{HV}$	f <sub>p</sub>	v = V/PHF	$x f_{HV} x f_{p}$
Freeway	1526	0.90	Level	7	0	0.	.966	1.00	17	 55
Ramp	1060	0.90	Level	13	0	0.	.939	1.00	12	54
UpStream										
DownStream										
		Merge Areas					]	Diverge Areas		
Estimation	า of v <sub>12</sub>				Estimat	ion c	of v <sub>12</sub>			
	V <sub>12</sub> = V <sub>F</sub>	(P <sub>EM</sub> )					V <sub>12</sub> =	: V <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>	P <sub>ED</sub>	
- <sub>EQ</sub> =		ation 13-6 or	13-7)		L <sub>EQ</sub> =			Equation 13-1		)
P <sub>FM</sub> =		Equation (E			P <sub>FD</sub> =			000 using Equ		
/ <sub>12</sub> =	pc/h	_4 (-			V <sub>12</sub> =			755 pc/h	addorr (Exm	510 17
$V_3$ or $V_{av34}$	•	Equation 13	-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>			pc/h (Equatio	on 12 14 or	12 17)
	2,700 pc/h?		-14 01 13-17)			<b>&gt; 2 7</b>		Yes ☑ No	)   13-1 <del>4</del> 0	13-17)
						• .				
	1.5 * V <sub>12</sub> /2		-16, 13-18, or					☐ Yes ☑ No oc/h (Equation	12 16 12	10 or 12
f Yes,V <sub>12a</sub> =	13-19)		-10, 13-16, 01		If Yes,V <sub>12a</sub> =	=		9)	13-10, 13-	10, 01 13
Capacity (		,			Capacit	v Ch	ecks	,		
, ,	Actual	С	apacity	LOS F?			Actual	Ca	pacity	LOS F
					V <sub>F</sub>		1755	Exhibit 13-8	3 4500	No
$V_{FO}$		Exhibit 13-8			V <sub>FO</sub> = V <sub>F</sub>	V.	501	Exhibit 13-8	3 4500	No
FU					V <sub>R</sub>	· R	1254	Exhibit 13-1	_	No
	<u> </u>									INO
-low Ente	ring Merge In			\/:-I-t:0	Flow En	_	<del></del>	rge Influen		Minletine
\/	Actual		Desirable	Violation?		$\overline{}$	Actual	Max Desirat		Violation
V <sub>R12</sub>		Exhibit 13-8			V <sub>12</sub>		1755	Exhibit 13-8	4400:All	No
	ervice Detern				-			terminatio		<u>F)</u>
$D_R = 5.475$	+ 0.00734 v <sub>R</sub> +	0.0078 V <sub>12</sub> -	0.00627 L <sub>A</sub>			$D_R = 4$	1.252 + 0	.0086 V <sub>12</sub> - 0.	009 L <sub>D</sub>	
$P_R = (pc/n)$	ni/ln)				$D_R = 17$	7.1 (pc	/mi/ln)			
.OS = (Exh	ibit 13-2)				LOS = B	(Exhil	bit 13-2)			
	termination				Speed L	<u> </u>		on		
					<del>  '                                   </del>		xhibit 13			
•	oit 13-11)					-	(Exhibit			
	(Exhibit 13-11)					-		· ·		
	(Exhibit 13-11)				$S_0$ = N/A mph (Exhibit 13-12)					
S = mph (	(Exhibit 13-13)				S = 49.7 mph (Exhibit 13-13)					
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	RAMP	S AND RAM	P JUNCTI	ONS WO	RKS	HEET				
General Information			Site Infor							
Analyst AJR	{	Fr	eeway/Dir of Tr		I-526 E	В				
Agency or Company Atki	ns	Ju	ınction		3320-E	B Off to U	S17 SB			
Date Performed 7/25	5/2014		ırisdiction							
	Peak	Ar	nalysis Year		2018 B	uild - Rive	r Center Site			
Project Description Navy Base IC	TF									
Inputs	I							ĭ		
Upstream Adj Ramp	1 1	nber of Lanes, N er of Lanes, N	2 1					Downstrea Ramp	am Adj	
☐Yes ☐On	1 '	Lane Length, L	ı					I_ `		
☑ No ☐ Off	1	Lane Length L <sub>D</sub>	250					□Yes	On	
V NO DII	Freeway Volu		2006					☑ No	Off	
$L_{up} = ft$	Ramp Volum	e, V <sub>R</sub>	1039					L <sub>down</sub> =	ft	
V <sub></sub> = veh/h	Freeway Free	e-Flow Speed, S <sub>FF</sub>	55.0					V <sub>D</sub> =	veh/h	
$V_u = veh/h$	Ramp Free-F	low Speed, S <sub>FR</sub>	45.0					l' D	VO11/11	
Conversion to pc/h Un	der Base	Conditions						•		
(pc/h) V (Veh/hr)	PHF	Terrain	%Truck	%Rv		$f_{HV}$	fp	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>	
Freeway 2006	0.90	Level	6	0	0.	971	1.00	22	96	
Ramp 1039	0.90	Level	11	0	0.	948	1.00	12	18	
UpStream										
DownStream	M A						3'			
Estimation of v <sub>12</sub>	Merge Areas			Estimat	ion o	f v	Diverge Areas			
				LStillati	1011 0					
$V_{12} = V_{1}$							= V <sub>R</sub> + (V <sub>F</sub> - V			
	ation 13-6 or			L <sub>EQ</sub> =			Equation 13-			
1 101	g Equation (	Exhibit 13-6)		P <sub>FD</sub> =		1.	000 using Eq	uation (Exhi	bit 13-7)	
$V_{12} = pc/h$				V <sub>12</sub> =		22	296 pc/h			
$V_3$ or $V_{av34}$ pc/h	(Equation 13	3-14 or 13-17)		$V_3$ or $V_{av34}$		0	pc/h (Equati	on 13-14 oı	<sup>-</sup> 13-17)	
Is $V_3$ or $V_{av34} > 2,700$ pc/h? $V_6$	es 🗌 No			Is V <sub>3</sub> or V <sub>av</sub>	34 > 2,7	00 pc/h? [	☐Yes ☑No			
Is $V_3$ or $V_{av34} > 1.5 * V_{12}/2 \square Y_6$	es 🗌 No			Is V <sub>3</sub> or V <sub>av</sub>	<sub>34</sub> > 1.5	* V <sub>12</sub> /2	☐Yes ☑ No			
f Ves V = pc/h	(Equation 13	3-16, 13-18, or		If Yes,V <sub>12a</sub> =	=	r	c/h (Equation	13-16, 13	-18, or 13-	
10 10	9)						9)			
Capacity Checks		Sec. 29	1 100 50	Capacit	y Cn			9	1,00,5	
Actual		Capacity	LOS F?	\/		Actual		apacity	LOS F	
.,				V <sub>F</sub>		2296	Exhibit 13-	_	No	
V <sub>FO</sub>	Exhibit 13-8			$V_{FO} = V_{F}$	- v <sub>R</sub>	1078	Exhibit 13-	_	No	
				V <sub>R</sub>		1218	Exhibit 13-		No	
Flow Entering Merge I			1	Flow En	_		rge Influer			
Actual		Desirable	Violation?	.,	$\overline{}$	Actual	Max Desira		Violation	
V <sub>R12</sub>	Exhibit 13-8			V <sub>12</sub>		2296	Exhibit 13-8	4400:All	No No	
Level of Service Deter							terminatio		<i>F</i> )	
$D_R = 5.475 + 0.00734 v_R +$	0.0078 V <sub>12</sub>	- 0.00627 L <sub>A</sub>					.0086 V <sub>12</sub> - 0	.009 L <sub>D</sub>		
O <sub>R</sub> = (pc/mi/ln)				l ''	1.7 (pc	,				
LOS = (Exhibit 13-2)				_	`	oit 13-2)				
Speed Determination				Speed L	Deter	minatio	on			
M = (F-354 40 44)				1 '		xhibit 13				
M <sub>S</sub> = (Exibit 13-11)						S <sub>R</sub> = 49.7 mph (Exhibit 13-12)				
,				O <sub>R</sub> - 48	9. <i>1</i> mpn	(LXIIIDIL	10 12)			
$S_R$ = mph (Exhibit 13-11)					-	(Exhibit	•			
$S_R$ = mph (Exhibit 13-11)				$S_0 = N$	/A mph	•	13-12)			

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	3325-U3 SB On	S17 SB Off to US17
Date Performed	7/25/2014		Jurisdiction	3D OII	
Analysis Time Period	AM Peak		Analysis Year	2018 Βι Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			es.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	466	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 7	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D		Is the	General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments				
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.966	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f <sub>LW</sub>		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	55.0	mph	FFS	55.0	•
Base free-flow Speed,		mph	IFF3	55.0	mph
BFFS			<b>5</b> 1 (1)		
LOS and Performanc	e Measures	<u> </u>	Design (N)		
Operational (LOS)			Design (N)		
$v_p = (V \text{ or DDHV}) / (PHF x I)$	N x f		Design LOS		
$x f_p$	HV 268	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	$N \times f_{HV}$	pc/h/ln
S	55.0	mph	x f <sub>p</sub> )		po//////
$D = v_p / S$	4.9	pc/mi/ln	S		mph
LOS	A	p 6/11////	$D = v_p / S$		pc/mi/ln
			Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed	E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens	sity	$E_{\rm T}$ - Exhibits 11-10, 11-11,		f <sub>LC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate		e-flow speed	f <sub>n</sub> - Page 11-18		TRD - Page 11-11
LOS - Level of service	BFFS - Ba	ase free-flow	LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2	TAD Tage 11-11
speed DDHV - Directional design	hour volume		11-3	· · <b>_</b> ,	
DDTTV - Directional design	TIOUI VOIUITIE				

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	3325-US SB On	S17 SB Off to US17
Date Performed	7/25/2014		Jurisdiction	3D OII	
Analysis Time Period	PM Peak		Analysis Year	2018 Bu Site	ıild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			es.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	967	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 6	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		la //a	General Terrain:	Level	
DDHV = AADTXKXD		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments				
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] <i>0.971</i>	
Speed Inputs			Calc Speed Adj and		
Lane Width		ft	у просед на применения		
Rt-Side Lat. Clearance		ft	f <sub>LW</sub>		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	55.0	mph		55.0	•
Base free-flow Speed,	00.0	•	FFS	55.0	mph
BFFS		mph			
LOS and Performanc	e Measures	3	Design (N)		
Operational (LOS)			Design (N)		
Operational (LOS)	N v f		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x I)$	1 <sub>HV</sub> 553	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	$N \times f_{HV}$	20/b/l2
x f <sub>p</sub> )	<i>55</i> 0	mnh	x f <sub>p</sub> )		pc/h/ln
S D = y / S	55.0	mph	S		mph
$D = v_p / S$	10.1	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	Α		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed			f Evhihit 11.0
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>n</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18	11.0	TRD - Page 11-11
speed	h a		LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-∠,	
DDHV - Directional design	nour volume		1 1-0		

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	RA	MPS AND	RAMP JUNG	CTIONS W	ORKSHI	EET				
General In				Site Infor						
Analyst	AJR		Fr	eeway/Dir of Tr		I-526 EB				
gency or Comp				nction		3330-EB	On from U	IS17 SB		
ate Performed		5/2014		risdiction						
nalysis Time Pe		Peak	Ar	nalysis Year		2018 Buil	d - River C	Center Site		
	on Navy Base IC	TF								
nputs		L						1		
lpstream Adj Ra	mp	1	ber of Lanes, N	2					Downstre	am Adj
٦,,	0	Ramp Numbe	r of Lanes, N	1					Ramp	
Yes	On	Acceleration L	ane Length, L <sub>A</sub>	725					Yes	On
✓ No	Off	Deceleration L	ane Length L <sub>D</sub>						✓ No	□ O#
		Freeway Volu	me, V <sub>F</sub>	466					✓ No	Off
<sub>up</sub> = ft		Ramp Volume	, V <sub>D</sub>	359					L <sub>down</sub> =	ft
-			-Flow Speed, S <sub>FF</sub>	55.0						
u = ve	h/h	1	ow Speed, S <sub>FR</sub>	25.0					$V_D =$	veh/h
`~ m.v.~ v.~ i.~ i	- 40 ma/h llm		111	25.0						
onversion	n to pc/h Un √			1	1					
(pc/h)	(Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>H</sub>	v	f <sub>p</sub>	v = V/PHF	$x f_{HV} x f_{p}$
reeway	466	0.90	Level	7	0	0.96	6	1.00		536
Ramp	359	0.90	Level	3	0	0.98		1.00		405
JpStream										
DownStream										
		Merge Areas					Div	verge Areas		
stimation	of v <sub>12</sub>				Estimat	ion of	V <sub>12</sub>			
	V <sub>12</sub> = V <sub>F</sub>	(P <sub>FM</sub> )					V <sub>12</sub> = V <sub>1</sub>	R + (V <sub>F</sub> - V <sub>R</sub> )	)P <sub>ED</sub>	
EQ =	· <del>-</del> ·	uation 13-6 or	13-7)		L <sub>EQ</sub> =		(E	quation 13-	12 or 13-1	3)
FM =			ion (Exhibit 13-6)		P <sub>FD</sub> =			ing Equatio		
12 =	536 p		(=:::::::::::::::::::::::::::::::::::::		V <sub>12</sub> =			:/h	(=>::::0::::::::::::::::::::::::::::::::	.,
<sub>3</sub> or V <sub>av34</sub>			13-14 or 13-17)					c/h (Equation 1	3 1/1 or 13 1	7)
			13-14 01 13-17)		V <sub>3</sub> or V <sub>av34</sub>	> 2 700			3-14-01-13-1	1)
	2,700 pc/h? Ye							Yes No		
	1.5 * V <sub>12</sub> /2  \ Ye		) 16 12 19 or					Yes No	. 10 16 1	2 10 05
Yes,V <sub>12a</sub> =	13-19		3-16, 13-18, or		If Yes,V <sub>12a</sub> =	:	рс 13-	c/h (Equation 19)	1 13-16, 1	3-18, Or
Capacity C		/			Capacit	y Chec		- /		
•	Actual	C	apacity	LOS F?			Actual	Сар	acity	LOS F?
					V <sub>F</sub>			Exhibit 13-8	3	
V	941	Evhibit 12.9		No	$V_{FO} = V_{F}$	- V <sub>D</sub>		Exhibit 13-8	3	
$V_{FO}$	941	Exhibit 13-8		INO		R		Exhibit 13-		
					V <sub>R</sub>			10		
low Enter	ing Merge li	nfluence A	rea		Flow En	tering	Diverg	ge Influen	ce Area	
	Actual		Desirable	Violation?		Act		Max Desi	rable	Violation
$V_{R12}$	941	Exhibit 13-8	4600:AII	No	V <sub>12</sub>			Exhibit 13-8		
evel of Se	rvice Deter	mination (	if not F)		Level of	Servi	ce Dete	erminatio	n (if not	F)
D <sub>R</sub> = 5.47	′5 + 0.00734 v <sub>R</sub> +	0.0078 V <sub>12</sub> - 0.0	00627 L <sub>A</sub>			D <sub>R</sub> = 4.2	52 + 0.0	086 V <sub>12</sub> - 0.	009 L <sub>D</sub>	
<sub>R</sub> = 8.1 (pc					L	oc/mi/ln)			-	
	ibit 13-2)				1	Exhibit 1	3-2)			
`	ermination				Speed L			າ		
					<del>                                     </del>			,		
•						xhibit 13-	-			
	ph (Exhibit 13-11)				S <sub>R</sub> = mph (Exhibit 13-12)					
0	oh (Exhibit 13-11)				S <sub>0</sub> = mph (Exhibit 13-12)					
S = 51.2 mph (Exhibit 13-13)										
= 51.2 m	ph (Exhibit 13-13)		S = m	ph (Exhibi	t 13-13)					

		RAI	MPS AND	RAMP JUN	CTIONS W	/ORKSHI	EET				
General	Inform		0715	10 11111 0011	Site Infor						
Analyst		AJR		Fr	eeway/Dir of Ti		I-526 EB				
Agency or C	ompany	Atkin	S	Ju	inction		3330-EB O	n from US	17 SB		
Oate Perform	ned	7/25/	2014	Ju	ırisdiction						
Analysis Tim		PM P		Ar	nalysis Year		2018 Build	- River Ce	nter Site		
	cription	Navy Base ICT	F								
nputs			1								
Jpstream Ad	dj Ramp		1	per of Lanes, N	2					Downstre	am Adj
			Ramp Number	of Lanes, N	1					Ramp	
Yes	☐ On		Acceleration L	ane Length, L <sub>A</sub>	725					□Yes	On
✓ No	Off		Deceleration L	ane Length L <sub>D</sub>							_
			Freeway Volur	ne, V <sub>F</sub>	967					✓ No	Off
up =	ft		Ramp Volume	, V <sub>D</sub>	290					L <sub>down</sub> =	ft
				Flow Speed, S <sub>FF</sub>	55.0						
/ <sub>u</sub> =	veh/h		Ramp Free-Flo		25.0					$V_D =$	veh/h
2001/04	ion to	/b		111	25.0						
onvers	sion to	) pc/n Und ∀		Conditions		1	1				
(pc/h	1)	(Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>		f <sub>p</sub>	v = V/PHI	$F \times f_{HV} \times f_{p}$
Freeway		967	0.90	Level	6	0	0.971		1.00		1107
Ramp		290	0.90	Level	3	0	0.985		1.00		327
JpStream											
DownStrear	n										
Merge Areas						<u> </u>		Dive	rge Areas		
Estimation of v <sub>12</sub>					Estimati	ion of v	12				
		V <sub>12</sub> = V <sub>F</sub>	(P <sub>FM</sub> )				\	<sub>12</sub> = V <sub>R</sub>	+ (V <sub>F</sub> - V <sub>R</sub> )	)P <sub>FD</sub>	
. <sub>EQ</sub> =		(Equa	ation 13-6 or	13-7)		L <sub>EQ</sub> =		(Ec	uation 13-	12 or 13-1	13)
) <sub>FM</sub> =				on (Exhibit 13-6)	1	P <sub>FD</sub> =			ng Equation		
/ <sub>12</sub> =		1107		(======================================		V <sub>12</sub> =		pc/		(=:::::::::::::::::::::::::::::::::::::	- ' /
7 <sub>3</sub> or V <sub>av34</sub>				3-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>			n (Equation 1	3_14 or 13_4	17)
	> 2 700	pc/h? Ye		10-14-01-10-17)		Is V <sub>3</sub> or V <sub>av3</sub>	> 2 700 n			0 14 01 10	''',
		V <sub>12</sub> /2		-16, 13-18, or					es	13 16 1	3 19 or
Yes,V <sub>12a</sub> =	:	13-19)		-10, 10-10, 01		If Yes,V <sub>12a</sub> =	:	13-1		1 13-10, 1	J- 10, OI
Capacit	y Ched	cks				Capacity	y Check	(S	,		
		Actual	С	apacity	LOS F?		F	ctual	Сар	acity	LOS F?
						V <sub>F</sub>			Exhibit 13-8	3	
V <sub>FC</sub>		1434	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>D</sub>		Exhibit 13-8	3	
*FC		1404	LXIIIDIL 13-0		INO		- K		Exhibit 13-		
						V <sub>R</sub>			10		
low En	tering	Merge In	fluence A	rea		Flow En	tering L	Diverge	e Influen	ce Area	1
		Actual	Max [	Desirable	Violation?		Actu	al	Max Desi	rable	Violation?
$V_{R12}$	2	1434	Exhibit 13-8	4600:AII	No	V <sub>12</sub>		E	xhibit 13-8		
evel of	Servi	ce Detern	nination (i	f not F)		Level of	Servic	e Dete	rminatio	n (if not	<i>F</i> )
D <sub>R</sub> =	5.475 + (	).00734 v <sub>R</sub> + (	0.0078 V <sub>12</sub> - 0.0	0627 L <sub>A</sub>			D <sub>R</sub> = 4.25	2 + 0.00	86 V <sub>12</sub> - 0.	009 L <sub>D</sub>	
	2.0 (pc/mi/					L	c/mi/ln)				
11	 (Exhibit 1	•					xhibit 13-	2)			
	·										
		ination				Speed D					
Ü						$D_s = (Exhibit 13-12)$					
		Exhibit 13-11)				I	ph (Exhibit				
		xhibit 13-11)				S <sub>0</sub> = mph (Exhibit 13-12)					
5 = 51	1.1 mph (E	Exhibit 13-13)				S = m <sub>l</sub>	ph (Exhibit	13-13)			
	51.1 mph (Exhibit 13-13) right © 2012 University of Florida, All Rights Reserved					HCS2010 <sup>TM</sup> Version 6.41 Generated: 12/9/2014 9:2					

		MPS AND	RAMP JUN			El		
General Info				Site Infor				
nalyst	AJR		Fr	eeway/Dir of Tr	avel I	-526 EB		
gency or Company				nction	3	3340-EB On fro	m US17 NB	
Date Performed	7/25/			risdiction				
Analysis Time Perio			Ar	nalysis Year	2	2018 Build - Riv	er Center Site	
Project Description	Navy Base ICT	ſF						
nputs								
Jpstream Adj Ramp	)	Freeway Num	ber of Lanes, N	2				Downstream Adj
		Ramp Numbe	r of Lanes, N	1				Ramp
Yes O	n	Acceleration L	ane Length, L	550				□Yes □On
☑ No ☐ Ot	ee	Deceleration I	ane Length L					
✓ No ☐ Ot	11	Freeway Volum	- 0	825				☑ No ☐ Off
- <sub>up</sub> = ft		Ramp Volume		24				L <sub>down</sub> = ft
-ир		1	11					down
/ <sub>u</sub> = veh/ł	า	1	-Flow Speed, S <sub>FF</sub>	55.0				V <sub>D</sub> = veh/h
u		Ramp Free-Fl	ow Speed, S <sub>FR</sub>	45.0				
Conversion t	o pc/h Une	der Base	Conditions		_			
(pc/h)	() (a la /la r)	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	f <sub>p</sub>	$v = V/PHF \times f_{HV} \times f_{D}$
	(Veh/hr)						<del>                                     </del>	
Freeway	825	0.90	Level	7	0	0.966	1.00	949
Ramp	24	0.90	Level	4	0	0.980	1.00	27
UpStream DownStream	+	+						
Downstream		Merge Areas					Diverge Areas	<u> </u>
Estimation of V <sub>12</sub>					Estimation	on of v <sub>12</sub>	Divorge Alleut	,
							., ., .	
	$V_{12} = V_{F}$					V <sub>12</sub> =	= V <sub>R</sub> + (V <sub>F</sub> - \	
- <sub>EQ</sub> =	(Equ	ation 13-6 or	13-7)		L <sub>EQ</sub> =		(Equation 1	3-12 or 13-13)
P <sub>FM</sub> =	1.000	using Equat	ion (Exhibit 13-6)		P <sub>FD</sub> =		using Equat	tion (Exhibit 13-7)
/ <sub>12</sub> =	949 p	c/h			V <sub>12</sub> =		pc/h	
/ <sub>3</sub> or V <sub>av34</sub>	0 pc/	h (Equation	13-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>		pc/h (Equation	n 13-14 or 13-17)
Is V <sub>3</sub> or V <sub>av34</sub> > 2,70	-		,			<sub>4</sub> > 2,700 pc/h?		•
Is V <sub>3</sub> or V <sub>av34</sub> > 1.5						4 > 1.5 * V <sub>12</sub> /2		
			3-16, 13-18, or		1			ion 13-16, 13-18, or
f Yes,V <sub>12a</sub> =	13-19)		7-10, 10-10, 01		If Yes,V <sub>12a</sub> =		13-19)	1011 13-10, 13-10, 01
Capacity Che	ecks				Capacity	Checks	<u> </u>	
	Actual	С	apacity	LOS F?		Actua	I C	Capacity LOS F
			-		V <sub>F</sub>		Exhibit 1	3-8
	070	E 1 11 11 40 0		l ,,	$V_{FO} = V_{F}$	- V_	Exhibit 1	
$V_{FO}$	976	Exhibit 13-8		No		*R	Exhibit 1	
					$V_R$		10	13-
Flow Enterin	a Merae Ir	fluence A	rea	•	Flow Ent	tering Dive	erae Influe	ence Area
	Actual		Desirable	Violation?		Actual		esirable Violation
V <sub>R12</sub>	976	Exhibit 13-8	4600:All	No	V <sub>12</sub>	1	Exhibit 13-8	
K12						Service D		ion (if not F)
evel of Son						$O_{R} = 4.252 +$		
	0.00104 V R T	3.0010 V <sub>12</sub> - 0.0	0021 L <sub>A</sub>		1		0.0000 v <sub>12</sub> -	0.000 LD
D <sub>R</sub> = 5.475 +	// <sub>m</sub> \					c/mi/ln)		
$D_{R} = 5.475 + 0.00$	•					1 11 11 40 01		
$D_R = 5.475 + 20$ $D_R = 9.6 \text{ (pc/mi)}$ $D_R = A \text{ (Exhibit)}$	: 13-2)					xhibit 13-2)		
$D_R = 5.475 + 20$ $D_R = 9.6 \text{ (pc/mi)}$ $D_R = A \text{ (Exhibit)}$	: 13-2)				<u> </u>	eterminat	ion	
$D_R = 5.475 + 10$ $D_R = 9.6 \text{ (pc/mi)}$ $D_R = A \text{ (Exhibit)}$ $D_R = A \text{ (Exhibit)}$	13-2) <b>mination</b>				Speed D		ion	
$D_R = 5.475 + 0.00$ $D_R = 9.6 \text{ (pc/mi)}$ $D_R = 0.000$	13-2) <b>mination</b> ibit 13-11)				Speed D  D <sub>s</sub> = (Ex	eterminat khibit 13-12)		
$D_{\rm R}$ = 9.6 (pc/mi) $D_{\rm R}$ = 9.6 (pc/mi) $D_{\rm R}$ = 0.282 (Ex. $D_{\rm R}$ = 51.3 mph	mination ibit 13-11) (Exhibit 13-11)				Speed D $D_s = (Ex \\ S_R = mp$	eterminat khibit 13-12) h (Exhibit 13-12	2)	
$D_R = 5.475 + 10$ $D_R = 9.6 \text{ (pc/mi)}$ $D_R = 9.6 \text{ (pc/mi)}$ $D_R = 0.282 \text{ (Ex. S)}$	13-2) <b>mination</b> ibit 13-11)				$\begin{array}{ccc} \textbf{Speed D} \\ \textbf{D}_{\text{S}} = & (\text{Ex} \\ \textbf{S}_{\text{R}} = & \text{mp} \\ \textbf{S}_{\text{0}} = & \text{mp} \end{array}$	eterminat khibit 13-12)	2) 2)	

	KAI	MPS AND	RAMP JUNG	CTIONS W	ORKSHE	ET			
General Infor				Site Infor					
Analyst	AJR		Fr	eeway/Dir of Tr		-526 EB			
Agency or Company		IS		nction		340-EB On fro	m US17 NB		
Date Performed	7/25/	2014	Ju	risdiction					
Analysis Time Period	d PM F	<sup>2</sup> eak	Ar	nalysis Year	2	2018 Build - Riv	er Center Site		
Project Description	Navy Base ICT	ſF							
Inputs								1	
Jpstream Adj Ramp		1 '	ber of Lanes, N	2				Downstre	am Adj
		Ramp Numbe	r of Lanes, N	1				Ramp	
☐ Yes ☐ Or	1	Acceleration L	ane Length, L <sub>A</sub>	550				□Yes	On
☑ No ☐ Of	f	Deceleration L	ane Length L <sub>D</sub>					✓No	□ o#
	•	Freeway Volu	me, V <sub>F</sub>	1257				I NO	Off
- <sub>up</sub> = ft		Ramp Volume	, V <sub>D</sub>	32				L <sub>down</sub> =	ft
			-Flow Speed, S <sub>FF</sub>	55.0				1.	
$I_{\rm u} = {\rm veh/h}$	1	1	ow Speed, S <sub>FR</sub>	45.0				$V_D =$	veh/h
Conversion to	o no/h Un		. 117	43.0					
	<i>o pc/ii oii</i> i					1 .			
(pc/h)	(Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	f <sub>p</sub>	v = V/PHF	$x f_{HV} x f_{p}$
Freeway	1257	0.90	Level	6	0	0.971	1.00	1	439
Ramp	32	0.90	Level	3	0	0.985	1.00		36
UpStream									
DownStream									
Merge Areas					<b>-</b>		Diverge Areas		
Estimation of	1 V 12				Estimation	on of V <sub>12</sub>			
	$V_{12} = V_{F}$	(P <sub>FM</sub> )				V <sub>12</sub> =	= V <sub>R</sub> + (V <sub>F</sub> - V	R)P <sub>FD</sub>	
- <sub>EQ</sub> =	(Equ	ation 13-6 or	13-7)		L <sub>EQ</sub> =		(Equation 13	3-12 or 13-1	3)
P <sub>FM</sub> =	1.000	using Equat	ion (Exhibit 13-6)		P <sub>FD</sub> =		using Equati	on (Exhibit 13	3-7)
/ <sub>12</sub> =	1439				V <sub>12</sub> =		pc/h	•	•
$V_3$ or $V_{av34}$		•	13-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>		pc/h (Equation	13-14 or 13-1	7)
ls V <sub>3</sub> or V <sub>av34</sub> > 2,70	-		10 11 01 10 11 )			. > 2 700 nc/h?	Yes No		• /
Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 '						•	Yes No		
			3-16, 13-18, or				pc/h (Equation		3-18 or
Yes,V <sub>12a</sub> =	13-19)		7 10, 10 10, 01		If Yes,V <sub>12a</sub> =		13-19)	on 10-10, 1	5-10, 01
Capacity Che	cks				Capacity	Checks			
	Actual	C	apacity	LOS F?		Actua	ıl Ca	apacity	LOS F?
					$V_{F}$		Exhibit 13	3-8	
$V_{FO}$	1475	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>	Exhibit 13	3-8	
FO					V <sub>R</sub>		Exhibit 1	3-	
	1						10		
								nco Aros	
Flow Entering	1			1 1 1 1 1 2	Flow Ent		erge Influe		\"   C
Flow Entering	Actual	Max	Desirable	Violation?		Actual	Max De		Violation
V <sub>R12</sub>	Actual 1475	Max Exhibit 13-8	Desirable 4600:All	Violation?	V <sub>12</sub>	Actual	Max De Exhibit 13-8	sirable	
V <sub>R12</sub> Level of Serv	Actual 1475 ice Detern	Max Exhibit 13-8	Desirable 4600:All if not F)		V <sub>12</sub> Level of	Actual Service D	Max De Exhibit 13-8 etermination	sirable on (if not	
V <sub>R12</sub> <b>Level of Serv</b> D <sub>R</sub> = 5.475 +	Actual 1475 ice Detern 0.00734 v <sub>R</sub> + 0	Max Exhibit 13-8	Desirable 4600:All if not F)		V <sub>12</sub> Level of	Actual Service D	Max De Exhibit 13-8	sirable on (if not	
V <sub>R12</sub> <b>Level of Serv</b> D <sub>R</sub> = 5.475 +	Actual 1475 ice Detern 0.00734 v <sub>R</sub> + 0	Max Exhibit 13-8	Desirable 4600:All if not F)		V <sub>12</sub> Level of	Actual Service D	Max De Exhibit 13-8 etermination	sirable on (if not	
$V_{R12}$ Level of Serv $D_R = 5.475 + 0$ $D_R = 13.5 \text{ (pc/m}$	Actual 1475 <b>ice Detern</b> 0.00734 v <sub>R</sub> + ( ni/ln)	Max Exhibit 13-8	Desirable 4600:All if not F)		V <sub>12</sub> Level of  D <sub>R</sub> = (po	Actual Service D OR = 4.252 +	Max De Exhibit 13-8 etermination	sirable on (if not	
$V_{R12}$ Level of Serv $D_R = 5.475 + 0$ $O_R = 13.5 \text{ (pc/m}$ $O_R = 0.000 + 0.000$	Actual 1475 ice Detern 0.00734 v <sub>R</sub> + ( ni/ln) 13-2)	Max Exhibit 13-8	Desirable 4600:All if not F)		V <sub>12</sub> Level of  D <sub>R</sub> = (po	Actual  Service D  O <sub>R</sub> = 4.252 + c/mi/ln)	Max De Exhibit 13-8 <b>eterminatio</b> 0.0086 V <sub>12</sub> - 0	sirable on (if not	
$V_{R12}$ Level of Serv $D_R = 5.475 + D_R = 13.5 \text{ (pc/m}$ .OS = B (Exhibit	Actual 1475  ice Determ 0.00734 v <sub>R</sub> + ( ni/ln) 13-2)  mination	Max Exhibit 13-8	Desirable 4600:All if not F)		V <sub>12</sub> Level of  D <sub>R</sub> = (po	Actual  Service D  R = 4.252 + C/mi/ln)  xhibit 13-2)	Max De Exhibit 13-8 <b>eterminatio</b> 0.0086 V <sub>12</sub> - 0	sirable on (if not	
$V_{R12}$ Level of Serv $D_R = 5.475 + 0$ $O_R = 13.5 \text{ (pc/m}$ $O_R = 0.08 = 0.289 \text{ (Exi}$	Actual 1475 ice Determ 0.00734 v <sub>R</sub> + 0 ii/ln) 13-2) inination bit 13-11)	Max Exhibit 13-8	Desirable 4600:All if not F)		V <sub>12</sub> Level of  D <sub>R</sub> = (po LOS = (Ex Speed D D <sub>s</sub> = (Ex	Actual  Service D  R = 4.252 +  C/mi/In)  xhibit 13-2)  eterminat  khibit 13-12)	Max De Exhibit 13-8  etermination 0.0086 V <sub>12</sub> - 0	sirable on (if not	
$V_{R12}$ Level of Serv $D_R = 5.475 + 0.00$ $D_R = 13.5 \text{ (pc/m}$ $D_R $	Actual 1475 ice Detern 0.00734 v <sub>R</sub> + ( ni/ln) 13-2) mination bit 13-11) (Exhibit 13-11)	Max Exhibit 13-8	Desirable 4600:All if not F)		$V_{12}$ Level of $D_R = (pc)$ LOS = (Ex Speed D $D_S = (Ex)$ $D_S = (Ex)$ $D_S = (Ex)$	Actual  Service D  R = 4.252 +  c/mi/ln)  xhibit 13-2)  eterminat.  khibit 13-12)  h (Exhibit 13-12)	Max De Exhibit 13-8  etermination 0.0086 V <sub>12</sub> - 0  ion	sirable on (if not	
$V_{R12}$ Level of Serv $D_R = 5.475 + 0$ $D_R = 13.5 \text{ (pc/m}$	Actual 1475 ice Determ 0.00734 v <sub>R</sub> + 0 ii/ln) 13-2) inination bit 13-11)	Max Exhibit 13-8	Desirable 4600:All if not F)		$\begin{array}{c} V_{12} \\ \hline \\ \textbf{Level of} \\ \hline \\ D_R = & (poly of a color of $	Actual  Service D  R = 4.252 +  C/mi/In)  xhibit 13-2)  eterminat  khibit 13-12)	Max De Exhibit 13-8 <b>eterminatio</b> 0.0086 V <sub>12</sub> - 0 <b>ion</b>	sirable on (if not	

		RAMP	S AND RAM	IP JUNCTI	ONS WO	ORKS	SHEET			
General Inf	ormation			Site Infor						
Analyst	AJR		F	reeway/Dir of Tr		I-526	WB			
Agency or Compa	any Atkin	IS	J	unction		4010-	WB Off to U	S17 NB		
Date Performed		/2014	•	urisdiction						
Analysis Time Pe			A	nalysis Year		2018	Build - Rive	Center Site		
	n Navy Base IC	TF								
Inputs		<u> </u>							ĺ	
Upstream Ac	lj Ramp	1	ber of Lanes, N	2					Downstrea	ım Adj
		Ramp Numbe	er of Lanes, N	1					Ramp	
□Yes	On	Acceleration I	ane Length, L <sub>A</sub>						□Yes	On
✓ No	Off	Deceleration I	Lane Length L <sub>D</sub>	300					E NI	
E NO		Freeway Volu	me, V <sub>E</sub>	1051					☑ No	Off
L <sub>up</sub> =	ft	Ramp Volume	•	305					L <sub>down</sub> =	ft
ч		1	-, - <sub>R</sub> -Flow Speed, S <sub>FF</sub>							
$V_u =$	veh/h	1	low Speed, S <sub>ER</sub>						V <sub>D</sub> =	veh/h
		l .	111	45.0						
Conversion	to pc/h Une	der Base	Conditions		1				1	
(pc/h)	(Veh/hr)	PHF	Terrain	%Truck	%Rv		$f_{HV}$	f <sub>p</sub>	v = V/PHF	$x\:f_{HV}\:x\:f_{p}$
Freeway	1051	0.90	Level	7	0	(	).966	1.00	12	09
Ramp	305	0.90	Level	13	0	_	).939	1.00	36	
UpStream										
DownStream										
		Merge Areas						Diverge Areas		
Estimation	of v <sub>12</sub>				Estima	tion	of v <sub>12</sub>			
	V <sub>12</sub> = V <sub>F</sub>	( P <sub>EM</sub> )					V <sub>12</sub> =	· V <sub>R</sub> + (V <sub>F</sub> - V	_)P_n	
- <sub>EQ</sub> =		ation 13-6 or	13-7)		L <sub>EQ</sub> =			Equation 13-		)
P = FM		Equation (			P <sub>FD</sub> =			000 using Eq		
<sub>12</sub> =	pc/h	Equation (	EXHIBIT TO 0)		V <sub>12</sub> =			209 pc/h	uation (Exili	bit 10-7)
	•	Tauatian 12	14 or 12 17)					•	10 11	. 40 47)
V <sub>3</sub> or V <sub>av34</sub>			-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>			pc/h (Equation	on 13-14 or	13-17)
	2,700 pc/h? ☐ Ye				_ ~ ~			☐ Yes ☑ No		
	.5 * V <sub>12</sub> /2 Ye		40 40 40					☐Yes ☑ No	40.40.40	40 40
f Yes,V <sub>12a</sub> =	pc/n ( 13-19)		-16, 13-18, or		If Yes,V <sub>12a</sub>	=		oc/h (Equatior 9)	1 13-16, 13-	·18, or 13
Capacity C		/			Capaci	tv Cł		<u> </u>		
supusity of	Actual		Capacity	LOS F?		ty Or	Actual	Ca	apacity	LOS F
	7 totaan	† Ť	rapaonty	20011	V <sub>F</sub>		1209	Exhibit 13-		No
V		Exhibit 13-8			V <sub>FO</sub> = V			Exhibit 13-		_
$V_{FO}$		LATIIDIL 13-0					1			No
					V <sub>R</sub>	<u> </u>	361	Exhibit 13-1		No
Flow Enteri	ing Merge In			1 1 1 1 2 2	Flow E	nteri		rge Influen		1 1 7 7 7 7 7
	Actual		Desirable	Violation?		+	Actual	Max Desira	1	Violation
V <sub>R12</sub>		Exhibit 13-8			V <sub>12</sub>		1209	Exhibit 13-8	4400:All	No
Level of Service Determination (if not F)					Level o			terminatio		<u>F)                                    </u>
$D_R = 5.475 +$	0.00734 v <sub>R</sub> +	0.0078 V <sub>12</sub> -	- 0.00627 L <sub>A</sub>			$D_R =$	4.252 + 0	.0086 V <sub>12</sub> - 0	.009 L <sub>D</sub>	
O <sub>R</sub> = (pc/mi	i/ln)				D <sub>R</sub> = 1	1.9 (p	c/mi/ln)			
* *	oit 13-2)				I	3 (Exh	ibit 13-2)			
Speed Dete					-	•	rminatio	on		
					<del>  '                                   </del>		Exhibit 13			
•	t 13-11)					-				
	Exhibit 13-11)				S <sub>R</sub> = 50.7 mph (Exhibit 13-12)					
	xhibit 13-11)				$S_0$ = N/A mph (Exhibit 13-12)					
S = mph (E	Exhibit 13-13)				S = 5	0.7 mp	h (Exhibit	13-13)		
	niversity of Florida,	All Rights Reser	ved		HCS2010 <sup>TN</sup>	<sup>M</sup> Versi	on 6.41	G	enerated: 12/9	/2014 9:34

		RAMP	S AND RAN	IP JUNCTI	ONS WC	ORKS	HEET			
General Inf	ormation			Site Infor	mation					
Analyst	AJR		F	reeway/Dir of Tr	avel	I-526 \	VB			
Agency or Compa	any Atkin	ns .	J	unction		4010-\	NB Off to U	S17 NB		
Date Performed		/2014	-	urisdiction						
Analysis Time Pe				nalysis Year		2018 E	Build - Rive	Center Site		
	n Navy Base IC	TF								
Inputs		In	hfl N	0						
Upstream Ad	lj Ramp	1 '	ber of Lanes, N	2					Downstrea	m Adj
□Yes	□On	Ramp Numbe	-	1					Ramp	
		1	ane Length, L <sub>A</sub>						☐Yes	On
✓ No	Off	1	ane Length L <sub>D</sub>	300					☑ No	Off
	_	Freeway Volu		1067						
L <sub>up</sub> =	ft	Ramp Volume	, V <sub>R</sub>	436					L <sub>down</sub> =	ft
\/ -	vah/h	Freeway Free	-Flow Speed, S <sub>FF</sub>	55.0					V <sub>D</sub> =	veh/h
V <sub>u</sub> =	veh/h	Ramp Free-Fl	ow Speed, S <sub>FR</sub>	45.0					L D	VO1811
Conversion	to pc/h Un	der Base (	Conditions							
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	$\top$	f <sub>HV</sub>	f <sub>p</sub>	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>
Freeway	1067	0.90	Level	6	0	0	.971	1.00	12	21
Ramp	436	0.90	Level	8	0	0	.962	1.00	50	)4
UpStream										
DownStream										
-atimatian		Merge Areas			Fatimes	tion a	<u> </u>	Diverge Areas		
Estimation	or v <sub>12</sub>				Estimat	tion c				
	$V_{12} = V_{F}$	(P <sub>FM</sub> )					V <sub>12</sub> =	= V <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>	R)P <sub>FD</sub>	
- <sub>EQ</sub> =	(Equa	ation 13-6 or	13-7)		L <sub>EQ</sub> =		(	Equation 13-1	2 or 13-13	)
P <sub>FM</sub> =	using	Equation (E	Exhibit 13-6)		P <sub>FD</sub> =		1.	000 using Equ	uation (Exhil	oit 13-7)
/ <sub>12</sub> =	pc/h				V <sub>12</sub> =		1:	221 pc/h		
/ <sub>3</sub> or V <sub>av34</sub>	pc/h (	Equation 13	-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>		0	pc/h (Equation	on 13-14 or	13-17)
	2,700 pc/h?	s 🗆 No				,34 > 2,7		☐Yes ☑ No		
	.5 * V <sub>12</sub> /2 □ Ye				_ ~ ~			☐Yes ☑ No		
f Yes,V <sub>12a</sub> =			-16, 13-18, or		If Yes,V <sub>12a</sub>			c/h (Equation	13-16, 13-	18, or 13
	13-19	)					1	9)		
Capacity C					Capacit	ty Ch	ľ			
	Actual	C	apacity	LOS F?	ļ ,,		Actual		pacity	LOS F
					V <sub>F</sub>		1221	Exhibit 13-8	3 4500	No
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$	<sub>F</sub> - V <sub>R</sub>	717	Exhibit 13-8	3 4500	No
					$V_R$		504	Exhibit 13-1	0 2100	No
Flow Enteri	ing Merge In	fluence A	rea	**	Flow E	nterir	ng Dive	rge Influen	ce Area	
	Actual		Desirable	Violation?		_	Actual	Max Desiral		Violation
$V_{R12}$		Exhibit 13-8			V <sub>12</sub>		1221	Exhibit 13-8	4400:All	No
	rvice Deterr	nination (i	if not F)	<u> </u>		f Ser	vice De	terminatio	n (if not l	<del></del> F)
	0.00734 v <sub>R</sub> +				1			.0086 V <sub>12</sub> - 0.		,
) <sub>R</sub> = (pc/mi		12	^				:/mi/ln)	14	D	
• •	oit 13-2)				l		bit 13-2)			
Speed Dete	<u> </u>				Speed					
•	t 13-11)				1	-	xhibit 13			
	Exhibit 13-11)					-	(Exhibit	•		
	Exhibit 13-11)				$S_0$ = N/A mph (Exhibit 13-12)					
S = mph (E	Exhibit 13-13)				S = 50.5 mph (Exhibit 13-13)					
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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	T	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>I-526 W</i>	 B
Agency or Company	Atkins		From/To	4015-U	S17 NB off to US17
Date Performed	7/25/2014		Jurisdiction	NB On	
Analysis Time Period	AM Peak		Analysis Year	2018 Βι Site	ıild - River Center
Project Description Navy	Base ICTF			0.10	
✓ Oper.(LOS)			Des.(N)	Plar	nning Data
Flow Inputs					-
Volume, V AADT	746	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 7	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments				
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	D10.966	
Speed Inputs			Calc Speed Adj and		
Lane Width		ft	Odic Opeca Auj ana		
Rt-Side Lat. Clearance		ft			
Number of Lanes, N	2	п	f <sub>LW</sub>		mph
	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD	55.0	ramps/mi	TRD Adjustment		mph
FFS (measured)	55.0	mph	FFS	55.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performanc	e Measures	 S	Design (N)		
			Design (N)		
Operational (LOS)			Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub> 429	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f	
x f <sub>p</sub> )	120	ролин	$x f_p$	· · · · · HV	pc/h/ln
S	55.0	mph	s 'p'		mph
$D = v_p / S$	7.8	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	Α		Required Number of Lanes	s N	ρο/ιτι/ιτ
Glossary			Factor Location	-,	
N - Number of lanes	S - Spee	<u></u>			
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
· ·		-	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate LOS - Level of service		e-flow speed ase free-flow	f <sub>p</sub> - Page 11-18		TRD - Page 11-11
speed	Di 1 0 - Di	200 HOO-HOW	LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	
DDHV - Directional design	hour volume		11-3		
·	da All Dighte Dece				ated: 12/0/2014 0:36 AM

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	4015-U NB On	S17 NB off to US17
Date Performed	7/25/2014		Jurisdiction	ND OII	
Analysis Time Period	PM Peak		Analysis Year	2018 Bu Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	□Plar	nning Data
Flow Inputs					
Volume, V AADT	631	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 6	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjus	tments				
$f_p$	1.00		$E_R$	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] <i>0.971</i>	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	55.0	mph	FFS	55.0	mph
Base free-flow Speed, BFFS		mph		33.0	Πρπ
LOS and Performanc	e Measures	 S	Design (N)		
			Design (N)		
Operational (LOS)			Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub> 361	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>uv</sub>	
x f <sub>p</sub> )		<b>P</b> • · · · · · · · ·	x f <sub>p</sub> )	ΠV	pc/h/ln
S	55.0	mph	S P		mph
D = v <sub>p</sub> / S	6.6	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	Α		Required Number of Lanes	s, N	<b>P</b> 3
Glossary			Factor Location		
N - Number of lanes	S - Spe	ed			f Fubibit 44.0
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12	11 12	f <sub>LW</sub> - Exhibit 11-8
v <sub>n</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18	44.0	TRD - Page 11-1
speed			LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	
DDHV - Directional design	hour volume		11-3		

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	RA	MPS AND	RAMP JUN	CTIONS W	/ORKSHI	EET					
General Inf				Site Infor							
Analyst	AJR		Fr	eeway/Dir of Tr		I-526 WB					
gency or Compa	any Atkir	ns	Ju	nction		4020-WB On	from US17 NB				
ate Performed		/2014		risdiction							
nalysis Time Pe		Peak	Ar	nalysis Year		2018 Build - I	River Center Sit	е			
<u> </u>	n Navy Base IC	TF									
nputs		l									
Jpstream Adj Rai	mp	1	ber of Lanes, N	2				Downstr	eam Adj		
<b>7</b>		Ramp Number	r of Lanes, N	1				Ramp			
Yes	On	Acceleration L	ane Length, L <sub>A</sub>	775				□Yes	On		
✓ No	Off	Deceleration L	ane Length L <sub>D</sub>					. III No	□ O#		
	0	Freeway Volui	me, V <sub>F</sub>	746				✓ No	Off		
<sub>up</sub> = ft		Ramp Volume	, V <sub>D</sub>	907				L <sub>down</sub> =	ft		
			-Flow Speed, S <sub>FF</sub>	55.0							
u = vel	h/h	1	ow Speed, S <sub>FR</sub>	25.0				$V_D =$	veh/h		
Na mirawa ia w	. 40 ma/h l lm		110	23.0							
onversion	to pc/h Un			1	1	1					
(pc/h)	(Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	f <sub>p</sub>	v = V/PH	$IF \times f_{HV} \times f_{p}$		
reeway	746	0.90	Level	7	0	0.966	1.00		858		
Ramp	907	0.90	Level	5	0	0.976	1.00		1033		
JpStream											
DownStream											
		Merge Areas					Diverge Ar	eas			
stimation	of v <sub>12</sub>				Estimat	ion of v <sub>12</sub>	2				
	V <sub>12</sub> = V <sub>F</sub>	(P <sub>FM</sub> )				V <sub>1</sub>	$_{2} = V_{R} + (V_{F})$	- V <sub>R</sub> )P <sub>FD</sub>			
EQ =		ation 13-6 or	13-7)		L <sub>EQ</sub> =	,		13-12 or 13-	13)		
FM =			ion (Exhibit 13-6)		P <sub>FD</sub> =			uation (Exhibit			
12 =	858 p		(=/		V <sub>12</sub> =		pc/h	200000 (2700000	,		
<sub>3</sub> or V <sub>av34</sub>			13-14 or 13-17)		·-		•	tion 13-14 or 13	17\		
			13-14 01 13-17)		V <sub>3</sub> or V <sub>av34</sub>	> 2.700 pg/			-17)		
	2,700 pc/h? ☐ Ye						/h? ☐ Yes ☐				
	.5 * V <sub>12</sub> /2 Ye		16 12 10 0		is v <sub>3</sub> or v <sub>av3</sub>	<sub>34</sub> > 1.5 ° V <sub>12</sub> /	<sup>2</sup> □Yes □		10 10		
Yes,V <sub>12a</sub> =	pc/n 13-19		3-16, 13-18, or		If Yes,V <sub>12a</sub> =	:	pc/n (Equ 13-19)	ation 13-16,	13-18, or		
Capacity C		/			Capacit	y Checks					
	Actual	С	apacity	LOS F?	1		tual	Capacity	LOS F?		
			•		V <sub>F</sub>		Exhib	it 13-8			
	4004	E 1:1:140.0		N.	$V_{FO} = V_{F}$	- V_	Exhib	it 13-8			
$V_{FO}$	1891	Exhibit 13-8		No		*R	Exhib				
					$V_R$			0			
low Enteri	ing Merge Ir	nfluence A	rea		Flow En	tering D	iverge Infl	uence Are	<u></u>		
	Actual		Desirable	Violation?		Actual		Desirable	Violation		
V <sub>R12</sub>	1891	Exhibit 13-8	4600:All	No	V <sub>12</sub>		Exhibit 1	3-8			
	rvice Deteri	mination (i	if not F)			Service	Determina	ation (if no	t F)		
	5 + 0.00734 v <sub>R</sub> +						+ 0.0086 V <sub>1</sub>		,		
$_{R} = 14.9 (p)$		12	A		L	oc/mi/ln)	1	2 0			
	· ·					•	Λ.				
<u> </u>	bit 13-2)				_	xhibit 13-2					
	rmination				<del>  '                                   </del>	Determina	ation				
Speed Dete					$D_s = (E$	xhibit 13-12)					
	Exibit 13-11)						S <sub>R</sub> = mph (Exhibit 13-12)				
I <sub>S</sub> = 0.308 (	·				S <sub>R</sub> = m	ph (Exhibit 13	3-12)				
0.308 ( R = 51.0 m	·				1	ph (Exhibit 13 ph (Exhibit 13	*				
$l_{\rm S} = 0.308  ($ $_{\rm R} = 51.0  {\rm mp}$ $_{\rm 0} = N/A  {\rm mp}$	ph (Exhibit 13-11)				$S_0 = m$		3-12)				

			MPS AND	RAMP JUN			:E I				
General	Inforn				Site Infor						
Analyst		AJR		Fr	eeway/Dir of Tr		-526 WB				
Agency or C		Atkins			nction	2	4020-WB On	from US17 N	ΝB		
Date Perforn		7/25/2			risdiction		2040 D 111 1	o. o .	0''		
Analysis Tim		PM P		Ar	nalysis Year		2018 Build - F	River Center	Site		
nputs	ription r	Navy Base ICT	Γ								
-			Eroowov Num	har of Lanca N							
Jpstream Ad	lj Ramp		l '	ber of Lanes, N	2					Downstre	am Adj
Yes	On		Ramp Numbe	•	1					Ramp	
⊔ res			Acceleration L	ane Length, L <sub>A</sub>	775					□Yes	On
✓ No	Off		Deceleration L	ane Length L <sub>D</sub>						☑ No	Off
_	_		Freeway Volu	me, V <sub>F</sub>	631					INO	
up =	ft		Ramp Volume	e, V <sub>R</sub>	886					L <sub>down</sub> =	ft
			Freeway Free	-Flow Speed, S <sub>FF</sub>	55.0					,	
/ <sub>u</sub> =	veh/h		1	ow Speed, S <sub>FR</sub>	25.0					V <sub>D</sub> =	veh/h
Convor	ion to			Conditions	20.0						
		<del>βε/π οπε</del> ∀					1 -	1 .			
(pc/h	)	(Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	f	р	v = V/PHI	$= x f_{HV} x f_{p}$
Freeway		631	0.90	Level	6	0	0.971	1.0	0		722
Ramp		886	0.90	Level	4	0	0.980	1.0	0		1004
UpStream											
DownStrean	n										
			Merge Areas					Diverge A	Areas		
Estimati	on of	V <sub>12</sub>				Estimati	on of v <sub>12</sub>	2			
		V <sub>12</sub> = V <sub>F</sub>	(P <sub>FM</sub> )				V <sub>1</sub>	<sub>2</sub> = V <sub>R</sub> + (V	/ <sub>F</sub> - V <sub>R</sub>	)P <sub>ED</sub>	
- <sub>EQ</sub> =			ation 13-6 or	13-7)		L <sub>EQ</sub> =				12 or 13-1	3)
P <sub>FM</sub> =				ion (Exhibit 13-6)		P <sub>FD</sub> =				n (Exhibit 1	
/ <sub>12</sub> =		722 p		(=/		V <sub>12</sub> =		pc/h	. 4	(=/	• . ,
12 / <sub>3</sub> or V <sub>av34</sub>				13-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>		•	uation 1	3-14 or 13-	17\
	> 2 700	-		13-14-01-13-17)			> 2 700 no/			J-14 01 1J-	17)
		pc/h? Yes				Is V <sub>3</sub> or V <sub>av3</sub>					
		V <sub>12</sub> /2		0 16 12 19 or		Is V <sub>3</sub> or V <sub>av3</sub>				- 10 16 1	2 10 05
Yes,V <sub>12a</sub> =		13-19)		3-16, 13-18, or		If Yes,V <sub>12a</sub> =		13-19)	qualior	n 13-16, 1	3-18, 01
Capacity	v Chec					Capacity	/ Checks				
,		Actual		apacity	LOS F?			tual	Can	acity	LOS F
				- 1		V <sub>F</sub>			nibit 13-8		
	1				l	V <sub>FO</sub> = V <sub>F</sub>	- \/		nibit 13-8		
$V_{FC}$	)	1726	Exhibit 13-8		No		*R		nibit 13-	_	
	1					$V_R$			10	1	
low En	terina	Merae In	fluence A	rea	•	Flow Ent	terina Di	verae In	fluen	ce Area	
		Actual		Desirable	Violation?		Actual		lax Desi		Violation
V <sub>R12</sub>	,	1726	Exhibit 13-8	4600:All	No	V <sub>12</sub>		Exhibi			
			nination (			Level of	Service			n (if not	F)
			0.0078 V <sub>12</sub> - 0.0				$O_R = 4.252$				- /
	5.475 · 0		12 0.0	-A		1		5.0000 V	12 0.	-D	
11		•					c/mi/ln)				
	(Exhibit 1	<u> </u>					xhibit 13-2				
Speed D	eterm	ination				Speed D		ation			
M <sub>S</sub> = 0.3	304 (Exibi	t 13-11)				,	khibit 13-12)				
	•	xhibit 13-11)				S <sub>R</sub> = mp	h (Exhibit 13	-12)			
Λ		-				1	h (Exhibit 13	-12)			
$S_0 = N/$	A mnh (F	XUIDIE 19-111				- ()					
0	A mph (E: .0 mph (E	Exhibit 13-11)				ľ	h (Exhibit 13	•			

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed Analysis Time Period	AJR Atkins 7/25/2014 AM Peak		Highway/Direction of Trave From/To Jurisdiction Analysis Year	4030-US US17/H 2018 Bu	
Project Description Navy	Base ICTF		<u> </u>	Site	
✓ Oper.(LOS)			Des.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D	1653	veh/h veh/day veh/h	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub> %RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0.90 7 0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub> E <sub>T</sub>	1.00 1.5		$E_R$ $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1.2 1)] 0.966	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance Number of Lanes, N	2	ft	f <sub>LW</sub>		mph
Total Ramp Density, TRD	2	ramps/mi	f <sub>LC</sub> TRD Adjustment		mph mph
FFS (measured) Base free-flow Speed, BFFS	55.0	mph mph	FFS	55.0	mph
LOS and Performanc	e Measures	3	Design (N)		
Operational (LOS)  v <sub>p</sub> = (V or DDHV) / (PHF x l x f <sub>p</sub> ) S D = v <sub>p</sub> / S LOS	N x f <sub>HV</sub> 950 55.0 17.3 B	pc/h/ln mph pc/mi/ln	Design (N) Design LOS $v_p = (V \text{ or DDHV}) / (PHF \text{ x} \text{ x } f_p)$ S $D = v_p / S$ Required Number of Lanes		pc/h/ln mph pc/mi/ln
Glossary			Factor Location	<u> </u>	
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed DDHV - Directional design	BFFS - Ba		E <sub>R</sub> - Exhibits 11-10, 11-12 E <sub>T</sub> - Exhibits 11-10, 11-11, $f_p$ - Page 11-18 LOS, S, FFS, $v_p$ - Exhibits 11-3	11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed Analysis Time Period	AJR Atkins 7/25/2014 PM Peak		Highway/Direction of Trave From/To Jurisdiction Analysis Year	4030-U US17/H	
Project Description Navy	Base ICTF			One	
✓ Oper.(LOS)			Des.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D	1517	veh/h veh/day veh/h	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub> %RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0.90 6 0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub> E <sub>T</sub>	1.00 1.5		$E_R$ $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1.2 1)] 0.971	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured) Base free-flow Speed, BFFS	55.0	mph mph	FFS	55.0	mph
LOS and Performanc	e Measures	 S	Design (N)		
Operational (LOS)  v <sub>p</sub> = (V or DDHV) / (PHF x I x f <sub>p</sub> ) S D = v <sub>p</sub> / S LOS	N x f <sub>HV</sub> 868 55.0 15.8 B	pc/h/ln mph pc/mi/ln	Design (N) Design LOS $v_p = (V \text{ or DDHV}) / (PHF \text{ x} \text{ x} f_p)$ S $D = v_p / S$ Required Number of Lanes		pc/h/ln mph pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed DDHV - Directional design	BFFS - Ba		$E_R$ - Exhibits 11-10, 11-12 $E_T$ - Exhibits 11-10, 11-11, $f_p$ - Page 11-18 LOS, S, FFS, $v_p$ - Exhibits 11-3	11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1

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	RAI	MPS AND	RAMP JUN	CTIONS W	ORKSH	EET				
General Infor				Site Infor						
Analyst	AJR		Fr	reeway/Dir of Tr		I-526 \	VB			
Agency or Company	Atkin	s	Ju	unction		4020-\	VB On from	US17/Hungryne	ес	
Date Performed	7/25/2	2014	Jι	urisdiction						
Analysis Time Period			Aı	nalysis Year		2018 E	Build - River	Center Site		
Project Description	Navy Base ICT	F								
Inputs										
Upstream Adj Ramp		Freeway Num Ramp Numbe	ber of Lanes, N	2 1					Downstrea Ramp	ım Adj
☐ Yes ☐ Or		· ·	ane Length, L	425					_ '	
		1	Lane Length, L <sub>A</sub>	423					Yes	☐ On
☑ No ☐ Of	f	Freeway Volu	- 5	1653					☑ No	Off
- <sub>up</sub> = ft		Ramp Volume		867					L <sub>down</sub> =	ft
ир			Flow Speed, S <sub>FF</sub>	55.0						
$V_{\rm u} = {\rm veh/h}$	1		low Speed, S <sub>FR</sub>	45.0					V <sub>D</sub> =	veh/h
Conversion t				70.0						
(pc/h)	V	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	fp	v = V/PHF	x f <sub>HV</sub> x f <sub>n</sub>
Freeway	(Veh/hr) 1653	0.90	Level	7	0	_	.966	1.00		901
Ramp	867	0.90	Level	25	0	_	.889	1.00		084
UpStream	001	0.00	20101	20		╅	.000	1.00		001
DownStream										
		Merge Areas				4.		iverge Areas		
Estimation of	1 V <sub>12</sub>				Estima	tion c				
	$V_{12} = V_{F}$	(P <sub>FM</sub> )					$V_{12} = V_{12}$	$V_R + (V_F - V_R)$	)P <sub>FD</sub>	
- <sub>EQ</sub> =	(Equa	ation 13-6 o	r 13-7)		L <sub>EQ</sub> =			Equation 13-		
P <sub>FM</sub> =	1.000	using Equat	tion (Exhibit 13-6)	)	P <sub>FD</sub> =		ι	ısing Equatio	n (Exhibit 13	-7)
/ <sub>12</sub> =	1901				V <sub>12</sub> =			oc/h		
$V_3$ or $V_{av34}$			13-14 or 13-17)	)	V <sub>3</sub> or V <sub>av34</sub>			oc/h (Equation 1	3-14 or 13-1	7)
Is $V_3$ or $V_{av34} > 2,70$								Yes □No		
Is $V_3$ or $V_{av34} > 1.5$			2.40.40.40		Is V <sub>3</sub> or V <sub>a</sub>	<sub>v34</sub> > 1.5		Yes □No	40.40.40	. 40
f Yes,V <sub>12a</sub> =	pc/n ( 13-19)		3-16, 13-18, or		If Yes,V <sub>12a</sub>	=		oc/h (Equation 3-19)	1 13-16, 13	3-18, or
Capacity Che					Capaci	ty Ch		,		
-	Actual		Capacity	LOS F?			Actual	Cap	acity	LOS F?
					V <sub>F</sub>			Exhibit 13-8	3	
$V_{FO}$	2985	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>		Exhibit 13-8	3	
10					V <sub>R</sub>			Exhibit 13-		
Flow Entering	Morgo In	fluonco	lroa				na Divo	10	co Aroa	
TOW ETILETING	Actual	1	Desirable	Violation?	I-IOW EI	1	Actual	rge Influen Max Desi		Violation?
V <sub>R12</sub>	2985	Exhibit 13-8	4600:All	No	V <sub>12</sub>	$\top$	0.001	Exhibit 13-8		
Level of Serv				-	<del> </del>	f Ser	vice De	terminatio	n (if not	<b>F</b> )
	0.00734 v <sub>R</sub> + 0	<u> </u>			1			.0086 V <sub>12</sub> - 0.		,
O <sub>R</sub> = 25.6 (pc/m	11		••		$D_R = ($	pc/mi/l			2	
OS = C (Exhibit					I '' '	Exhibi	•			
Speed Deterr	· · · · · · · · · · · · · · · · · · ·				Speed			n		
M <sub>S</sub> = 0.360 (Exi					<del> </del>	Exhibit '				
-	(Exhibit 13-11)						nibit 13-12)			
	Exhibit 13-11)						nibit 13-12)			
	(Exhibit 13-11)				ľ		nibit 13-13)			
	,	Rights Reserve	٠		HCS2010				Congratadi	12/9/2014 9:

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	RAI	MPS AND	RAMP JUN	CTIONS W	ORKSH	EET				
General Infor				Site Infor						
Analyst	AJR		Fr	eeway/Dir of Tr	avel	I-526 \				
Agency or Company	Atkin	S	Ju	ınction		4020-\	NB On from	US17/Hungryne	ec	
Date Performed	7/25/	2014	Ju	ırisdiction						
Analysis Time Period				nalysis Year		2018 E	Build - River	Center Site		
Project Description	Navy Base ICT	F								
Inputs										
Jpstream Adj Ramp		· ·	ber of Lanes, N	2					Downstrea	m Adj
☐ Yes ☐ Or	•	Ramp Numbe		1					Ramp	
□ res □ Oi	I	1	ane Length, L <sub>A</sub>	425					☐Yes	On
☑ No ☐ Of	f	1	Lane Length L <sub>D</sub>						☑ No	Off
_ #		Freeway Volu	'	1517						ft
<sub>-up</sub> = ft		Ramp Volume		1254					L <sub>down</sub> =	11
/ <sub>u</sub> = veh/h	1		e-Flow Speed, S <sub>FF</sub>	55.0					V <sub>D</sub> =	veh/h
			low Speed, S <sub>FR</sub>	45.0						
Conversion t	11 -	der Base	Conditions	1	1				1	
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	$f_p$	v = V/PHF	$x f_{HV} x f_{p}$
Freeway	1517	0.90	Level	6	0	-	.971	1.00	1	736
Ramp	1254	0.90	Level	15	0	$\rightarrow$	.930	1.00	14	198
UpStream										
DownStream	<u> </u>									
Estimation of		Merge Areas			Estima	tion 1		iverge Areas		
_sumauUn O		, <u> </u>			Louilla	uon (		,		
	$V_{12} = V_{F}$							$V_R + (V_F - V_R)$	. 5	
- <sub>EQ</sub> =		ation 13-6 o			L <sub>EQ</sub> =			Equation 13-		
P <sub>FM</sub> =			tion (Exhibit 13-6)		P <sub>FD</sub> =			ising Equatio	n (Exhibit 13	-7)
/ <sub>12</sub> =	1736				V <sub>12</sub> =			oc/h		
/ <sub>3</sub> or V <sub>av34</sub>			13-14 or 13-17)	)	V <sub>3</sub> or V <sub>av34</sub>			oc/h (Equation 1	3-14 or 13-17	<b>7</b> )
Is $V_3$ or $V_{av34} > 2,70$								Yes No		
Is $V_3$ or $V_{av34} > 1.5$			2 16 12 19 or					Yes No	. 12 16 13	10 or
f Yes,V <sub>12a</sub> =	13-19)		3-16, 13-18, or		If Yes,V <sub>12a</sub>	=		oc/h (Equatior 3-19)	11 13-16, 13	- 18, Of
Capacity Che					Capaci	ty Ch		,		
	Actual		Capacity	LOS F?			Actual	Сар	acity	LOS F?
					V <sub>F</sub>			Exhibit 13-8	3	
$V_{FO}$	3234	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>		Exhibit 13-8	3	
FO					V <sub>R</sub>			Exhibit 13-		1
		61	\				D:	10	<u> </u>	<u> </u>
Flow Entering	1 -	1		Violation?	riow Ei	1		rge Influen Max Desi		Violation
V <sub>R12</sub>	Actual 3234	Exhibit 13-8	Desirable 4600:All	Violation? No	V <sub>12</sub>	+	Actual	Exhibit 13-8	Ianic	Violation?
Level of Serv	1			140		f Sor	vico Do	terminatio	n (if not	<u></u>
	0.00734 v <sub>R</sub> + (				1			0086 V <sub>12</sub> - 0.		<i>' )</i>
$D_{R} = 27.3 (\text{pc/m})$		12 0.	<b>-</b> A			pc/mi/l		12 0.	<u>-</u> D	
$O_R = 27.3 \text{ (pc/n)}$ OS = C  (Exhibit)					., ,		t 13-2)			
<u> </u>	· · · · · · · · · · · · · · · · · · ·							n		
Speed Deterr					<del> </del>		minatio	11		
$M_{\rm S} = 0.382  (Exi$					ľ	Exhibit '				
	(Exhibit 13-11)				L.''		hibit 13-12)			
	Exhibit 13-11)				ľ		hibit 13-12)			
	(Exhibit 13-13)						hibit 13-13)			
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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>I-526 W</i>	B
Agency or Company	Atkins		From/To	4050-U	S17/Hungryneck to
Date Performed	7/25/2014		Jurisdiction	LongPt	
Analysis Time Period	AM Peak		Analysis Year	2018 Βι Site	ıild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			es.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	2520	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 9	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D			%RVs, P <sub>R</sub> General Terrain:	0 Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments		·		
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
É <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] 0.957	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f <sub>LW</sub>		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	65.0	mph	FFS	65.0	mph
Base free-flow Speed, BFFS		mph		00.0	тірп
LOS and Performanc	e Measures	<u> </u>	Design (N)		
Operational (LOS)			Design (N) Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x I)$	N x f <sub>HV</sub> 1463	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	
x f <sub>p</sub> )		·	x f <sub>p</sub> )	110	pc/h/ln
S	64.9	mph	S		mph
$D = v_p / S$	22.5	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	С		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed	E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens	ity	$E_{\rm T}$ - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate	FFS - Free	e-flow speed	$f_{\rm p}$ - Page 11-18	11-10	TRD - Page 11-11
LOS - Level of service	BFFS - Ba	ase free-flow	I.	11_2	IND - Fage 11-11
speed	hour volumo		LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-4,	
DDHV - Directional design	TIOUI VOIUITIE				

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	4050-US LongPt	S17/Hungryneck to
Date Performed	7/25/2014		Jurisdiction	Longit	
Analysis Time Period	PM Peak		Analysis Year	2018 Bu Site	ıild - River Center
Project Description Navy	Base ICTF				
☑ Oper.(LOS)			Des.(N)	☐ Plar	nning Data
Flow Inputs					
Volume, V AADT	2771	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 7	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length	Level mi	
			Up/Down %		
Calculate Flow Adjus	tments				
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] 0.966	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	65.0	mph	FFS	65.0	mph
Base free-flow Speed, BFFS		mph		00.0	mpn
LOS and Performanc	e Measures	<del></del>	Design (N)		
			Design (N)		
Operational (LOS)			Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x I)$	N x f <sub>HV</sub> 1593	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f	
x f <sub>p</sub> )		·	x f <sub>p</sub> )	110	pc/h/ln
S	64.5	mph	S		mph
$D = v_p / S$	24.7	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	С		Required Number of Lanes	s, N	·
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed			f Evhihit 11.0
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>p</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		se free-flow	f <sub>p</sub> - Page 11-18	11.0	TRD - Page 11-1
speed	la		LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-∠,	
DDHV - Directional design	nour volume		1-7		

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		RAMP	S AND RAN	IP JUNCTI	ONS WO	ORKS	SHEET			
General In	formation			Site Infor						
Analyst	AJR		F	reeway/Dir of Tr	avel	I-526	WB			
Agency or Comp	=			unction		4060-	WB Off to L	ong Point		
Date Performed		/2014	-	urisdiction						
Analysis Time Po			A	nalysis Year		2018	Build - Rive	Center Site		
	ion Navy Base IC	l F								
Inputs		Eroowov Num	shor of Lanca N	2					<u> </u>	
Upstream A	Adj Ramp	1	nber of Lanes, N						Downstrea	ım Adj
□Yes	□On	Ramp Numbe	•	1					Ramp	
□ 163		1	ane Length, L <sub>A</sub>						□Yes	On
✓ No	Off	Deceleration	Lane Length L <sub>D</sub>	250					✓No	Off
		Freeway Volu	ime, V <sub>F</sub>	2520						
L <sub>up</sub> =	ft	Ramp Volume	e, V <sub>R</sub>	516					L <sub>down</sub> =	ft
		Freeway Free	e-Flow Speed, S <sub>FF</sub>	65.0					\/ -	veh/h
$V_u =$	veh/h	Ramp Free-F	low Speed, S <sub>FR</sub>	45.0					V <sub>D</sub> =	VEII/II
Conversio	n to pc/h Un	der Base	Conditions							
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	f <sub>p</sub>	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>
Freeway	2520	0.90	Level	9	0	(	).957	1.00	29	26
Ramp	516	0.90	Level	17	0	(	).922	1.00	62	22
UpStream										
DownStream										
<b>-</b> 4: 4:		Merge Areas			F-4:	4	<u> </u>	Diverge Areas		
Estimation	1 of V <sub>12</sub>				Estima	tion				
	$V_{12} = V_{F}$	$(P_{FM})$					V <sub>12</sub> =	: V <sub>R</sub> + (V <sub>F</sub> - V	$_{R})P_{FD}$	
- <sub>EQ</sub> =	(Equa	ation 13-6 or	13-7)		L <sub>EQ</sub> =		(	Equation 13-	12 or 13-13	)
P <sub>FM</sub> =	using	Equation (	Exhibit 13-6)		P <sub>FD</sub> =		1.	000 using Eq	uation (Exhi	bit 13-7)
/ <sub>12</sub> =	pc/h				V <sub>12</sub> =		29	926 pc/h		
V <sub>3</sub> or V <sub>av34</sub>	pc/h (	Equation 13	-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>		0	pc/h (Equation	on 13-14 or	13-17)
	2,700 pc/h? ☐ Ye		•					Yes ☑ No		,
	1.5 * V <sub>12</sub> /2 ☐ Ye							Yes ☑ No		
			-16, 13-18, or		1 "			c/h (Equation	ı 13-16, 13-	18, or 13-
f Yes,V <sub>12a</sub> =	13-19				If Yes,V <sub>12a</sub>			9) ` '		
Capacity C	Checks	1			Capaci	ty Ch	ecks			
	Actual		Capacity	LOS F?			Actual		apacity	LOS F
					V <sub>F</sub>		2926	Exhibit 13-	_	No
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{I}$	<sub>F</sub> - V <sub>R</sub>	2304	Exhibit 13-	8 4700	No
					$V_R$	!	622	Exhibit 13-1	0 2100	No
Flow Enter	ring Merge In	fluence A	\rea		Flow E	nterii	ng Dive	rge Influen	ce Area	
	Actual	Max	Desirable	Violation?			Actual	Max Desira	ble	Violation <sup>e</sup>
$V_{R12}$		Exhibit 13-8			V <sub>12</sub>		2926	Exhibit 13-8	4400:All	No
Level of Se	ervice Detern	nination (	if not F)			f Ser	vice De	terminatio	n (if not l	F)
D <sub>R</sub> = 5.475	+ 0.00734 v <sub>R</sub> +	0.0078 V <sub>12</sub>	- 0.00627 L <sub>A</sub>			D <sub>R</sub> =	4.252 + 0	.0086 V <sub>12</sub> - 0.	.009 L <sub>D</sub>	-
D <sub>R</sub> = (pc/m		12	A		$D_R = 2$		c/mi/ln)	12	J	
	, ibit 13-2)				I		ibit 13-2)			
	ermination				1		rminatio	on		
	oit 13-11)				<del>  '</del>		Exhibit 13			
•	•						h (Exhibit			
	Exhibit 13-11)					-		-		
	Exhibit 13-11)				1 '	-	(Exhibit	· ·		
	Exhibit 13-13)						h (Exhibit	•		
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	RAMP	S AND RAM	IP JUNCTI	ONS WC	RKS	HEET				
General Information			Site Infor							
Analyst AJR		Fr	reeway/Dir of Tr	avel	I-526 V	VB				
Agency or Company Atkii			unction		4060-V	VB Off to L	ong Point			
	/2014		urisdiction							
3	Peak	IA.	nalysis Year		2018 B	uild - Rive	Center Site			
Project Description Navy Base IC	TF									
Inputs	Erooway Nun	abor of Longo N	2					1		
Upstream Adj Ramp	1	nber of Lanes, N						Downstrea	ım Adj	
☐Yes ☐ On	Ramp Numbe	· ·	1					Ramp		
□ 103 □ OII	1	Lane Length, L <sub>A</sub>						□Yes	On	
✓ No Off	1	Lane Length L <sub>D</sub>	250					☑ No	Off	
	Freeway Volu	ıme, V <sub>F</sub>	2771							
L <sub>up</sub> = ft	Ramp Volume	e, V <sub>R</sub>	1177					L <sub>down</sub> =	ft	
V/ =	Freeway Free	e-Flow Speed, S <sub>FF</sub>	65.0					V <sub>D</sub> =	veh/h	
$V_u = veh/h$	Ramp Free-F	low Speed, S <sub>FR</sub>	45.0					l D	VCII/II	
Conversion to pc/h Un	der Base	Conditions								
(pc/h) V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	f <sub>p</sub>	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>	
Freeway 2771	0.90	Level	7	0	0.	966	1.00	31	87	
Ramp 1177	0.90	Level	6	0	0.	971	1.00	13	47	
UpStream										
DownStream	<u></u>									
Estimation of v <sub>12</sub>	Merge Areas			Estimat	tion o	of v	Diverge Areas			
·-				LStilliat	1011 0					
$V_{12} = V_F$							· V <sub>R</sub> + (V <sub>F</sub> - V			
	ation 13-6 or			L <sub>EQ</sub> =		(	Equation 13-	12 or 13-13	)	
P <sub>FM</sub> = using	Equation (	Exhibit 13-6)		P <sub>FD</sub> =		1.	000 using Eq	uation (Exhi	bit 13-7)	
$l_{12} = pc/h$				V <sub>12</sub> =		3	187 pc/h			
$V_3$ or $V_{av34}$ pc/h	(Equation 13	3-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>		0	pc/h (Equation	on 13-14 or	13-17)	
Is $V_3$ or $V_{av34} > 2,700$ pc/h? $Y_6$	es 🗌 No			Is V <sub>3</sub> or V <sub>av</sub>	<sub>/34</sub> > 2,7	00 pc/h? [	☐Yes ☑ No			
Is $V_3$ or $V_{av34} > 1.5 * V_{12}/2 \square Y_6$	es 🗌 No			Is V <sub>3</sub> or V <sub>av</sub>	<sub>/34</sub> > 1.5	* V <sub>12</sub> /2	☐Yes ☑No			
		3-16, 13-18, or		If Yes,V <sub>12a</sub> :	=		c/h (Equation	13-16, 13-	18, or 13-	
10 10	)						9)			
Capacity Checks		Concoity.	LOS F?	Capacit	y CII			angoity.	LOS F	
Actual		Capacity	LUST!	V <sub>F</sub>		Actual 3187	Exhibit 13-	apacity 8 4700	No	
V	F 1:1:140.0							-	_	
V <sub>FO</sub>	Exhibit 13-8			$V_{FO} = V_{F}$		1840	Exhibit 13-		No	
				V <sub>R</sub>		1347	Exhibit 13-1		No	
Flow Entering Merge II			\f' \lat' \cdot	Flow Er	_	<del></del>	rge Influen		A Calada a	
Actual		Desirable	Violation?	\	$\overline{}$	Actual	Max Desiral		Violation	
V <sub>R12</sub>	Exhibit 13-8	if not F		V <sub>12</sub>		3187	Exhibit 13-8	4400:All	No No	
Level of Service Deter				1			terminatio		<u> </u>	
$D_R = 5.475 + 0.00734 v_R +$	0.0078 V <sub>12</sub>	- 0.00627 L <sub>A</sub>					.0086 V <sub>12</sub> - 0	.009 L <sub>D</sub>		
O <sub>R</sub> = (pc/mi/ln)				l ''	9.4 (pc	,				
OS = (Exhibit 13-2)				-	`	oit 13-2)				
Speed Determination	peed Determination					minatio				
$M_S = $ (Exibit 13-11)					-	xhibit 13				
2 - mmh / [[vhihit 12 11]						S <sub>R</sub> = 55.4 mph (Exhibit 13-12)				
o <sub>R</sub> − mpn (Exhibit 13-11)										
IX				1	I/A mph	(Exhibit	13-12)			
				$S_0 = N$	-	(Exhibit (Exhibit	•			

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	T	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>I-526 W</i>	 'B
Agency or Company	Atkins		From/To	4065-Lc	ongPt Off to
Date Performed	4/25/2014		Jurisdiction	LongPtE	=B On
Analysis Time Period	AM Peak		Analysis Year	2018 Βι Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			es.(N)	☐ Plar	nning Data
Flow Inputs					
Volume, V	2004	veh/h	Peak-Hour Factor, PHF	0.90	
AADT		veh/day	%Trucks and Buses, $P_T$	11	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		v a b /b	General Terrain:	Level	
DDHV = AADTXKXD		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments		<b>Ор/Вонн</b> 70		
	1.00		E <sub>R</sub>	1.2	
f <sub>p</sub> □	1.5		• •		
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$		
Speed Inputs			Calc Speed Adj and	FF3	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		$f_{LC}$		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	65.0	mph	FFS	65.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performanc	e Measures		Design (N)		
	<u> </u>	,			
Operational (LOS)			Design (N)		
$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	n a /h /l n	Design LOS	N v f	
x f <sub>p</sub> )	1175	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	IN X I <sub>HV</sub>	pc/h/ln
s	65.0	mph	x f <sub>p</sub> )		and a
$D = v_p / S$	18.1	pc/mi/ln	5		mph
LOS	С		$D = v_p / S$		pc/mi/ln
			Required Number of Lanes	5, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens	-	E <sub>T</sub> - Exhibits 11-10, 11-11,		f <sub>LC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate		e-flow speed	f <sub>n</sub> - Page 11-18		TRD - Page 11-11
LOS - Level of service	BFFS - Ba	se free-flow	LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	2.32
speed DDHV - Directional design	hour volume		11-3	,	
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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed	AJR Atkins 7/25/2014 PM Peak		Highway/Direction of Trave From/To Jurisdiction Analysis Year	4065-Lo LongPtl	ongPt Off to
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Pla	nning Data
Flow Inputs					
Volume, V AADT Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D	1594	veh/h veh/day veh/h	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub> %RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0.90 11 0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub> E <sub>T</sub>	1.00 1.5		$E_R$ $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1.2 1)] 0.948	
Speed Inputs			Calc Speed Adj and		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f <sub>LW</sub>		mph
Number of Lanes, N	2		$f_{LC}$		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured) Base free-flow Speed, BFFS	65.0	mph mph	FFS	65.0	mph
LOS and Performanc	e Measures	<del></del>	Design (N)		
Operational (LOS)  v <sub>p</sub> = (V or DDHV) / (PHF x I x f <sub>p</sub> ) S D = v <sub>p</sub> / S LOS	N x f <sub>HV</sub> 934 65.0 14.4 B	pc/h/ln mph pc/mi/ln	$\frac{\text{Design (N)}}{\text{Design LOS}}$ $v_p = (V \text{ or DDHV}) / (PHF \text{ x})$ $x f_p)$ $S$ $D = v_p / S$	N x f <sub>HV</sub>	pc/h/ln mph pc/mi/ln
			Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed DDHV - Directional design	BFFS - Ba		$E_R$ - Exhibits 11-10, 11-12 $E_T$ - Exhibits 11-10, 11-11, $f_p$ - Page 11-18 LOS, S, FFS, $v_p$ - Exhibits 11-3	11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1

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		MPS AND	RAMP JUN			ET		
General Infor	mation			Site Infor	mation			
Analyst	AJR		Fr	eeway/Dir of Tr	avel [-	-526 WB		
gency or Company				nction	4	1070-WB On from	m Long Point EB	
ate Performed		/2014		risdiction				
nalysis Time Period			Ar	nalysis Year	2	2018 Build - Rive	r Center Site	
Project Description	Navy Base IC	TF						
nputs		1						<u> </u>
Jpstream Adj Ramp		Freeway Numb	per of Lanes, N	2				Downstream Adj
		Ramp Number	of Lanes, N	1				Ramp
☐ Yes ☐ On	1	Acceleration L	ane Length, L <sub>A</sub>	950				□Yes □On
☑ No ☐ Off	r	Deceleration L	ane Length L					
✓ No ☐ Off	I	Freeway Volur		2004				☑ No ☐ Off
up = ft		1		601				L <sub>down</sub> = ft
<sub>up</sub> = ft		Ramp Volume	11					down
/u = veh/h	1	1	Flow Speed, S <sub>FF</sub>	65.0				$V_D = veh/h$
u voimi		Ramp Free-Flo	ow Speed, S <sub>FR</sub>	25.0				
Conversion to	o pc/h Un	der Base (	Conditions					•
(pc/h)	V	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	fp	v = V/PHF x f <sub>HV</sub> x f <sub>p</sub>
. ,	(Veh/hr)	-					<u> </u>	· '
Freeway	2004	0.90	Level	11	0	0.948	1.00	2349
Ramp	601	0.90	Level	20	0	0.909	1.00	735
JpStream		<del>                                     </del>						
DownStream		Marga Araga					Diverse Arese	
Estimation of	Fv	Merge Areas			Estimation	on of v	Diverge Areas	
-Stimation of					LStillati			
	$V_{12} = V_{F}$	(P <sub>FM</sub> )				V <sub>12</sub> =	$V_R + (V_F - V_R)$	<sub>R</sub> )P <sub>FD</sub>
- <sub>EQ</sub> =	(Equ	ation 13-6 or	13-7)		L <sub>EQ</sub> =		(Equation 13-	-12 or 13-13)
P <sub>FM</sub> =	1.000	using Equati	on (Exhibit 13-6)		P <sub>FD</sub> =		using Equation	on (Exhibit 13-7)
' <sub>12</sub> =	2349		,		V <sub>12</sub> =		pc/h	,
/ <sub>3</sub> or V <sub>av34</sub>			3-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>		pc/h (Equation 1	13_1/Lor 13_17\
ls V <sub>3</sub> or V <sub>av34</sub> > 2,70			13-14-01-13-17)			> 2 700 pc/b2	Yes No	
Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 *			10 10 10		is v <sub>3</sub> or v <sub>av34</sub>		☐ Yes ☐ No	
Yes,V <sub>12a</sub> =	pc/n 13-19		-16, 13-18, or		If Yes,V <sub>12a</sub> =		pc/h (Equatio 3-19)	on 13-16, 13-18, or
Capacity Che		/			Capacity		0-10)	
apacity one	Actual		apacity	LOS F?	L	Actual	Ca	pacity LOS F
	7101001	Ť	ариону	20011	V <sub>F</sub>	7101001	Exhibit 13-	
$V_{FO}$	3084	Exhibit 13-8		No	$V_{FO} = V_{F}$	·V <sub>R</sub>	Exhibit 13-	
					$V_R$		Exhibit 13	B-
low Entoring	Morgo Ir	efluonoo A	***			toring Dive	10	
low Entering	Actual		<b>rea</b> Desirable	Violation?	FIOW EN	Actual	rge Influer	
\/	t	<del></del>		i———	\/	Actual		irable violation
V <sub>R12</sub>	3084	Exhibit 13-8	4600:AII	No	V <sub>12</sub>	<u> </u>	Exhibit 13-8	
evel of Serv								n (if not F)
	0.00734 v <sub>R</sub> + (	0.0078 V <sub>12</sub> - 0.0	0627 L <sub>A</sub>			) <sub>R</sub> = 4.252 + (	0.0086 V <sub>12</sub> - 0	.009 L <sub>D</sub>
D <sub>R</sub> = 5.475 +	si/lm\				$D_R = (pc)$	c/mi/ln)		
D <sub>R</sub> = 5.475 +	11/111)				LOS = (Ex	xhibit 13-2)		
$D_R = 5.475 + 23.2 \text{ (pc/m}$	•							
$D_{R} = 5.475 + 23.2 \text{ (pc/m)}$ OS = C (Exhibit)	13-2)				<u> </u>		on	
$D_R = 5.475 + $ $D_R = 23.2 \text{ (pc/m)}$	13-2) mination				Speed D	eterminati	on	
$D_{R} = 5.475 + 0.00$ $D_{R} = 23.2 \text{ (pc/m}$ $D_{S} = 0.359 \text{ (Exilibit)}$	13-2) <b>mination</b> bit 13-11)				Speed D	etermination (thibit 13-12)		
$D_{R} = 5.475 + $ $D_{R} = 23.2 \text{ (pc/m}$ $D_{R} = 23.2 \text{ (pc/m}$ $D_{R} = 0.359 \text{ (Exility}$ $D_{R} = 0.359 \text{ (Exility}$ $D_{R} = 0.359 \text{ (Exility}$	13-2) <b>mination</b> bit 13-11) (Exhibit 13-11)				Speed D $D_s = (Ex \\ S_R = mp$	etermination thibit 13-12) h (Exhibit 13-12)	)	
$D_{\rm R} = 5.475 + $ $D_{\rm R} = 23.2 \text{ (pc/m}$ $D_{\rm R} = 23.2 \text{ (pc/m}$ $D_{\rm R} = 0.359 \text{ (Exilos)}$	13-2) <b>mination</b> bit 13-11)				Speed D $D_s = (Ext)$ $S_R = mp$	etermination (thibit 13-12)	)	

		RAI	MPS AND	RAMP JUN	CTIONS W	ORKSHE	EET			
General I	nforma				Site Infor					
Analyst		AJR		Fr	eeway/Dir of Tr		I-526 WB			
Agency or Con	mpany	Atkins	S		nction			rom Long Point El	3	
Date Performe	ed	7/25/2	2014	Ju	risdiction					
Analysis Time	Period	PM P	'eak	Ar	nalysis Year	2	2018 Build - Ri	ver Center Site		
Project Descrip	ption Nav	vy Base ICT	F							
nputs			1						1	
Jpstream Adj I	Ramp		1 '	ber of Lanes, N	2				Downstrea	am Adj
			Ramp Numbe	r of Lanes, N	1				Ramp	
☐ Yes [	☐ On		Acceleration L	ane Length, L <sub>A</sub>	950				□Yes	On
☑ No [	Off		Deceleration L	ane Length L <sub>D</sub>					✓ No	□ O#
	0		Freeway Volu	me, V <sub>F</sub>	1594				I № INO	Off
- <sub>up</sub> =	ft		Ramp Volume	, V <sub>D</sub>	668				L <sub>down</sub> =	ft
				-Flow Speed, S <sub>FF</sub>	65.0					
/ <sub>u</sub> = \ \	veh/h		1	ow Speed, S <sub>FR</sub>	25.0				$V_D =$	veh/h
Convorsi	ion to n			Conditions	20.0					
	ση το ρ	V			0/- :	2/2	Τ,	1 ,		
(pc/h)		(Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	f <sub>p</sub>	v = V/PHF	x t <sub>HV</sub> x f <sub>p</sub>
Freeway		1594	0.90	Level	11	0	0.948	1.00	1	869
Ramp		668	0.90	Level	15	0	0.930	1.00		798
UpStream										
DownStream								<u> </u>		
- - - - -	n of w		Merge Areas			Fatimati	on of w	Diverge Areas		
Estimatio	on or v <sub>1</sub>					Esuman	on of v <sub>12</sub>			
		$V_{12} = V_{F}$	(P <sub>FM</sub> )				V <sub>12</sub>	$= V_R + (V_F - V_F)$	<sub>R</sub> )P <sub>FD</sub>	
- <sub>EQ</sub> =		(Equa	ation 13-6 or	13-7)		L <sub>EQ</sub> =		(Equation 13	3-12 or 13-1	3)
P <sub>FM</sub> =		1.000	using Equat	ion (Exhibit 13-6)		P <sub>FD</sub> =		using Equati	on (Exhibit 13	3-7)
/ <sub>12</sub> =		1869 p	oc/h			V <sub>12</sub> =		pc/h		
/ <sub>3</sub> or V <sub>av34</sub>		0 pc/h	n (Equation	13-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>		pc/h (Equation	13-14 or 13-1	7)
ls V <sub>3</sub> or V <sub>av34</sub>	> 2,700 pc	-		,			, > 2,700 pc/h	? ☐ Yes ☐ No		,
Is V <sub>3</sub> or V <sub>av34</sub>								☐Yes ☐ No		
	12			3-16, 13-18, or		1		pc/h (Equation		3-18, or
Yes,V <sub>12a</sub> =		13-19)				If Yes,V <sub>12a</sub> =		13-19)		
Capacity	Check				1	Capacity	/ Checks			
		Actual	C	apacity	LOS F?	<u> </u>	Actu		apacity	LOS F?
						V <sub>F</sub>		Exhibit 13	3-8	
$V_{FO}$		2667	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>	Exhibit 13	3-8	
						V <sub>R</sub>		Exhibit 1:	3-	
		4 1	<i>f</i> A				4	10		
Jane End	ering iv	ierge in		<b>rea</b> Desirable	Violation?	Flow En		verge Influe Max De		Violation
Flow Ente	Ť	Actual					Actual	IVIAX De	อแ a มเซ	v iOidliO[]
Flow Ente		Actual 2667				\/		Evhihit 12 0		
V <sub>R12</sub>		2667	Exhibit 13-8	4600:AII	No	V <sub>12</sub>	Convinc !	Exhibit 13-8	on (if not	<i>E</i> \
V <sub>R12</sub> Level of S	Service	2667 Detern	Exhibit 13-8	4600:All <b>if not F)</b>		Level of		Determination		F)
V <sub>R12</sub> Level of S	<b>Service</b> 1.475 + 0.00	2667 <b>Detern</b> 0734 v <sub>R</sub> + 0	Exhibit 13-8	4600:All <b>if not F)</b>		Level of	O <sub>R</sub> = 4.252 +			F)
$V_{R12}$ <b>Level of S</b> $D_{R} = 5.$ $D_{R} = 20.0$	<b>Service</b> 3.475 + 0.00 (pc/mi/ln)	2667 • <b>Detern</b> 0734 v <sub>R</sub> + 0	Exhibit 13-8	4600:All <b>if not F)</b>		Level of  D <sub>R</sub> = (po	O <sub>R</sub> = 4.252 + c/mi/ln)	Determination		F)
$V_{R12}$ Level of S $D_R = 5.0$ $O_R = 20.0$ $O_R = B$ (E	<b>Service</b> .475 + 0.00  0 (pc/mi/ln)  Exhibit 13-2	2667 • <b>Detern</b> 0734 v <sub>R</sub> + 0	Exhibit 13-8	4600:All <b>if not F)</b>		Level of  D <sub>R</sub> = (po	O <sub>R</sub> = 4.252 <del>1</del> c/mi/ln) xhibit 13-2)	<b>Determinatio</b> - 0.0086 V <sub>12</sub> - 0		F)
$V_{R12}$ Level of S $D_R = 5.0$ $O_R = 20.0$ $O_R = B$ (E	<b>Service</b> .475 + 0.00  0 (pc/mi/ln)  Exhibit 13-2	2667 • <b>Detern</b> 0734 v <sub>R</sub> + 0	Exhibit 13-8	4600:All <b>if not F)</b>		Level of  D <sub>R</sub> = (po	O <sub>R</sub> = 4.252 + c/mi/ln)	<b>Determinatio</b> - 0.0086 V <sub>12</sub> - 0		F)
V <sub>R12</sub> Level of S D <sub>R</sub> = 5.0 OS = B (E	Service .475 + 0.00 0 (pc/mi/ln) Exhibit 13-2	2667 2	Exhibit 13-8	4600:All <b>if not F)</b>		Level of  D <sub>R</sub> = (po LOS = (E Speed D	O <sub>R</sub> = 4.252 <del>1</del> c/mi/ln) xhibit 13-2)	<b>Determinatio</b> - 0.0086 V <sub>12</sub> - 0		F)
$V_{R12}$ Level of S $D_R = 5.0$ OS = B (E  Speed De $M_S = 0.33$	Service .475 + 0.00 0 (pc/mi/ln) Exhibit 13-2 etermin 30 (Exibit 1	2667 2	Exhibit 13-8	4600:All <b>if not F)</b>		Level of   C	D <sub>R</sub> = 4.252 + c/mi/ln) xhibit 13-2) <b>etermina</b>	<b>Determinatio</b> - 0.0086 V <sub>12</sub> - 0		<i>F</i> )
$V_{R12}$ Level of S $D_R = 5.0$ $O_S = 0.0$ $O_S = 0.33$ $O_S = 0.33$ $O_S = 0.33$	Service 0.475 + 0.00 0 (pc/mi/ln) Exhibit 13-2 etermin 30 (Exibit 1 4 mph (Exh	2667 2734 v <sub>R</sub> + 0 2) 22) 23-11) 2617 2707 2817 2917 2917 2917 2917 2917 2917 2917 29	Exhibit 13-8	4600:All <b>if not F)</b>		$\begin{array}{ccc} \textbf{Level of} \\ & & \text{C} \\ \textbf{D}_{\text{R}} = & (\text{po} \\ \textbf{LOS} = & (\text{E} \\ \textbf{Speed D} \\ \textbf{D}_{\text{S}} = & (\text{E} \\ \textbf{S}_{\text{R}} = & \text{mp} \\ \end{array}$	D <sub>R</sub> = 4.252 + c/mi/ln) xhibit 13-2) <b>etermina</b> xhibit 13-12)	<b>Determinatio</b> - 0.0086 V <sub>12</sub> - 0 <b>tion</b>		F)
$V_{R12}$ Level of S $D_R = 5.0$ $OS = B (E)$ Speed De $M_S = 0.33$ $S_R = 57.4$ $S_0 = N/A$	Service .475 + 0.00 0 (pc/mi/ln) Exhibit 13-2 etermin 30 (Exibit 1	2667 2734 v <sub>R</sub> + 0 2) 20 21 21 21 21 21 21 21 21 21 21 21 21 21	Exhibit 13-8	4600:All <b>if not F)</b>		$\begin{array}{ccc} \textbf{Level of} \\ & & & \\ & & \\ & & \\ & \\ & \\ & \\ & \\ $	D <sub>R</sub> = 4.252 + c/mi/ln) xhibit 13-2) <b>etermina</b> xhibit 13-12) ch (Exhibit 13-	Determination  12)		F)

	RAI	MPS AND	RAMP JUNG	CTIONS W	ORKSHI	EET				
General Infor				Site Infor		<u></u>				
Analyst	AJR		Fr	eeway/Dir of Tr		I-526 V	/B			
Agency or Company	Atkin	S	Ju	nction		4080-V	/B On from	Long Point WB	}	
Date Performed	7/25/			risdiction						
analysis Time Period			Ar	nalysis Year		2018 B	uild - River	Center Site		
Project Description	Navy Base ICT	ΓF								
nputs		le							ĺ	
Jpstream Adj Ramp		1	ber of Lanes, N	2					Downstre	am Adj
☐ Yes ☐ On		Ramp Numbe		1					Ramp	
Yes On	I	Acceleration L	ane Length, L <sub>A</sub>	1025					□Yes	On
✓ No ☐ Off	f	Deceleration L	ane Length L <sub>D</sub>						☑ No	Off
		Freeway Volu	me, V <sub>F</sub>	2605					INO	
<sub>up</sub> = ft		Ramp Volume	, V <sub>R</sub>	1388					L <sub>down</sub> =	ft
			-Flow Speed, S <sub>FF</sub>	65.0						and to the
u = veh/h	l	1	ow Speed, S <sub>FR</sub>	45.0					V <sub>D</sub> =	veh/h
Conversion to	o nc/h Hni		111	10.0						
	<u> </u>			0/ TI-	0/ D	$\top$	<u>,                                      </u>		\//DLI	
(pc/h)	(Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	f <sub>p</sub>	V = V/PH	x f <sub>HV</sub> x f <sub>p</sub>
reeway	2605	0.90	Level	11	0	0.	948	1.00	3	3054
Ramp	1388	0.90	Level	5	0	0.	976	1.00	1	1581
JpStream										
DownStream		M A			-			A		
stimation of	Fv	Merge Areas			Estimat	ion o	f v	verge Areas		
.sumation of					LStillati	1011 0				
	$V_{12} = V_{F}$	(P <sub>FM</sub> )						$'_{R}$ + $(V_{F} - V_{R})$		
EQ =	(Equa	ation 13-6 or	13-7)		L <sub>EQ</sub> =		(F	Equation 13-	-12 or 13-1	3)
FM =	1.000	using Equat	ion (Exhibit 13-6)		P <sub>FD</sub> =		u	sing Equatio	n (Exhibit 1	3-7)
12 =	3054	pc/h			V <sub>12</sub> =		р	c/h		
′ <sub>3</sub> or V <sub>av34</sub>	0 pc/l	h (Equation	13-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>		р	c/h (Equation 1	13-14 or 13-1	7)
s V <sub>3</sub> or V <sub>av34</sub> > 2,70						<sub>34</sub> > 2,7	00 pc/h?	Yes No		
s V <sub>3</sub> or V <sub>av34</sub> > 1.5 *								Yes No		
Yes,V <sub>12a</sub> =			3-16, 13-18, or		If Yes,V <sub>12a</sub> =			c/h (Equatio		3-18, or
	13-19)						13	-19)` '		
Capacity Che	0				Capacit	y Ch				
	Actual	C	apacity	LOS F?	<u> </u>	$\rightarrow$	Actual		pacity	LOS F?
					V <sub>F</sub>			Exhibit 13-	8	
$V_{FO}$	4635	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>		Exhibit 13-	8	
. 0					V <sub>R</sub>			Exhibit 13	-	
	100	<u> </u>					5.	10		
·low Enterin¢	g Merge In			1 VE 1 C 0	Flow En			ge Influen		
	Actual						Actual	Max Desi	Irable	Violation
	Actual		Desirable 4600:All	Violation?	\/	+ '		Evhibit 12 0		
V <sub>R12</sub>	4635	Exhibit 13-8	4600:AII	Yes Yes	V <sub>12</sub>			Exhibit 13-8	/: <b>f</b> o 4	<u></u>
V <sub>R12</sub> .evel of Serv	4635 ice Detern	Exhibit 13-8	4600:All <b>if not F)</b>		Level of	f Serv	vice Det	erminatio		F)
V <sub>R12</sub> .evel of Serv D <sub>R</sub> = 5.475 +	4635 ice Detern 0.00734 v <sub>R</sub> + 0	Exhibit 13-8	4600:All <b>if not F)</b>		Level of	f Serv	vice Det			<i>F</i> )
V <sub>R12</sub> .evel of Serv D <sub>R</sub> = 5.475 +	4635 ice Detern 0.00734 v <sub>R</sub> + ( ni/ln)	Exhibit 13-8	4600:All <b>if not F)</b>		Level of	F Serv D <sub>R</sub> = 4 oc/mi/li	vice Det 252 + 0.0	erminatio		<i>F</i> )
V <sub>R12</sub> Level of Serv  D <sub>R</sub> = 5.475 +  d <sub>R</sub> = 34.5 (pc/m  OS = D (Exhibit	4635 ice Detern 0.00734 v <sub>R</sub> + 0 ni/ln) 13-2)	Exhibit 13-8	4600:All <b>if not F)</b>		Level of	f Serv	vice Det 252 + 0.0	erminatio		<i>F</i> )
V <sub>R12</sub> Level of Serv  D <sub>R</sub> = 5.475 + D <sub>R</sub> = 34.5 (pc/m	4635 ice Detern 0.00734 v <sub>R</sub> + 0 ni/ln) 13-2)	Exhibit 13-8	4600:All <b>if not F)</b>		Level of	F Server D <sub>R</sub> = 4 Doc/mi/li Exhibit	vice Det 252 + 0.0 n) 13-2)	<b>erminatio</b> 0086 V <sub>12</sub> - 0		<i>F</i> )
V <sub>R12</sub> Level of Serv  D <sub>R</sub> = 5.475 +  D <sub>R</sub> = 34.5 (pc/m  OS = D (Exhibit	4635 ice Detern 0.00734 v <sub>R</sub> + ( ni/ln) 13-2) mination	Exhibit 13-8	4600:All <b>if not F)</b>		Level of  D <sub>R</sub> = (p  LOS = (E	F Server D <sub>R</sub> = 4 Doc/mi/li Exhibit	vice Det 252 + 0.0 n) 13-2) minatio	<b>erminatio</b> 0086 V <sub>12</sub> - 0		<i>F</i> )
$V_{R12}$ Level of Serv $D_R = 5.475 + 34.5 \text{ (pc/m}$ $D_R = 0.631 \text{ (Exilibit)}$	4635 ice Detern 0.00734 v <sub>R</sub> + 0 ni/ln) 13-2) nination bit 13-11)	Exhibit 13-8	4600:All <b>if not F)</b>		D <sub>R</sub> = (p LOS = (E <b>Speed L</b> D <sub>s</sub> = (E	F Service  D <sub>R</sub> = 4  Doc/mi/lu  Exhibit  Determining	vice Det 252 + 0.0 n) 13-2) minatio	<b>erminatio</b> 0086 V <sub>12</sub> - 0		<i>F</i> )
V <sub>R12</sub> <b>Level of Serv</b> D <sub>R</sub> = 5.475 +  D <sub>R</sub> = 34.5 (pc/m  OS = D (Exhibit <b>Speed Detern</b> D <sub>S</sub> = 0.631 (Exilor 1)  D <sub>R</sub> = 50.5 mph (1)	4635 ice Detern 0.00734 v <sub>R</sub> + ( ii/ln) 13-2) mination bit 13-11) (Exhibit 13-11)	Exhibit 13-8	4600:All <b>if not F)</b>		$\begin{array}{cccc} \textbf{Level of} \\ \textbf{D}_{R} = & (\textbf{p} \\ \textbf{LOS} = & (\textbf{E} \\ \textbf{Speed L} \\ \textbf{D}_{s} = & (\textbf{E} \\ \textbf{S}_{R} = & \textbf{m} \\ \end{array}$	F Service  DR = 4  DC/mi/li  Exhibit  Deterrice  Exhibit 1  ph (Exhibit 1	vice Det 252 + 0.0 13-2) mination 3-12) ibit 13-12)	<b>erminatio</b> 0086 V <sub>12</sub> - 0		<i>F</i> )
V <sub>R12</sub> Level of Serv  D <sub>R</sub> = 5.475 +  D <sub>R</sub> = 34.5 (pc/m  OS = D (Exhibit  Speed Detern  1 <sub>S</sub> = 0.631 (Exil  R <sub>R</sub> = 50.5 mph ( 0 = N/A mph ()	4635 ice Detern 0.00734 v <sub>R</sub> + 0 ni/ln) 13-2) nination bit 13-11)	Exhibit 13-8	4600:All <b>if not F)</b>		$\begin{array}{cccc} \textbf{Level of} \\ \textbf{D}_{R} = & (p \\ \textbf{LOS} = & (E \\ \textbf{Speed L} \\ \textbf{D}_{S} = & (E \\ \textbf{S}_{R} = & m \\ \textbf{S}_{0} = & m \\ \end{array}$	D <sub>R</sub> = 4 Dc/mi/li Exhibit Deteri Exhibit 1 ph (Exhibit 1)	vice Det .252 + 0.0 1) 13-2) mination 3-12)	<b>erminatio</b> 0086 V <sub>12</sub> - 0		<i>F</i> )

		RAMPS AN	D RAMP JUN	CTIONS W	ORKSHI	EET			
General In	nformation			Site Infor					
Analyst		AJR	Fr	eeway/Dir of Tr		I-526 WB			
Agency or Com	npany	Atkins	Ju	nction		4080-WB On fro	om Long Point WI	В	
Oate Performed	d	7/25/2014		risdiction					
Analysis Time P		PM Peak	Ar	nalysis Year		2018 Build - Riv	er Center Site		
	otion Navy Bas	e ICTF							
nputs								1	
Jpstream Adj R	Ramp	1 '	mber of Lanes, N	2				Downstre	am Adj
	7.0	Ramp Numi	per of Lanes, N	1				Ramp	
Yes	On	Acceleration	Lane Length, L <sub>A</sub>	1025				□Yes	On
✓ No	Off	Deceleration	n Lane Length L <sub>D</sub>						_
<u> </u>	_ 011	Freeway Vo	lume, V <sub>E</sub>	2262				✓ No	Off
<sub>up</sub> = f	ft	Ramp Volur		1007				L <sub>down</sub> =	ft
up.			ee-Flow Speed, S <sub>FF</sub>	65.0				1	
/ <sub>u</sub> = v	/eh/h		Flow Speed, S <sub>FR</sub>	45.0				$V_D =$	veh/h
<u> </u>	4 //-		111	45.0					
onversio	on to pc/n	Under Base	Conditions	1	1	1	1		
(pc/h)	(Veh/l	r) PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	f <sub>p</sub>	v = V/PH	$F x f_{HV} x f_{p}$
Freeway	2262	0.90	Level	11	0	0.948	1.00		2652
Ramp	1007	0.90	Level	6	0	0.971	1.00		1152
JpStream									-
DownStream									
		Merge Areas	6				Diverge Areas		
stimatio	n of v <sub>12</sub>				Estimat	ion of v <sub>12</sub>			
	V <sub>12</sub>	= V <sub>F</sub> ( P <sub>FM</sub> )				V <sub>12</sub> :	= V <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>	)P <sub>ED</sub>	
EQ =		Equation 13-6	or 13-7)		L <sub>EQ</sub> =	12	(Equation 13		13)
P <sub>FM</sub> =		-	ation (Exhibit 13-6)		P <sub>FD</sub> =		using Equation		
<sup>FM</sup> 12 =		52 pc/h	ation (Exhibit 10 0)		V <sub>12</sub> =		pc/h	OII (EXIIIDIC I	01)
		•	- 10 11 or 10 17)		·-		pc/h (Equation	12 14 or 12	17\
or V <sub>av34</sub>			n 13-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>	> 0.700 = a/b0			17)
	> 2,700 pc/h?						☐Yes ☐ No		
	> 1.5 * V <sub>12</sub> /2		10 10 10 10		is v <sub>3</sub> or v <sub>av3</sub>	<sub>34</sub> > 1.5 ° V <sub>12</sub> /2	☐Yes ☐ No		0.40
Yes,V <sub>12a</sub> =		ic/n (Equation ii-19)	13-16, 13-18, or		If Yes,V <sub>12a</sub> =	:	pc/h (Equation 13-19)	on 13-16, 1	3-18, or
Capacity (		10)			Capacit	y Checks	10 10)		
puloney	Actu	al I	Capacity	LOS F?		Actua	al Ca	pacity	LOS F?
					V <sub>F</sub>		Exhibit 13		
						\/	Exhibit 13		
$V_{FO}$	3804	Exhibit 13-	8	No	$V_{FO} = V_{F}$	- VR	Exhibit 13		
					V <sub>R</sub>		10	)-	
low Ente	erina Mera	e Influence	Area		Flow En	terina Div	erge Influei	nce Area	<u> </u>
	Actua		x Desirable	Violation?	1011	Actual	Max Des		Violation?
\/	3804	Exhibit 13-	1	No	V <sub>12</sub>		Exhibit 13-8		
V D 12						Service D	eterminatio	n (if no	F)
V <sub>R12</sub>	Service De	ciiiiiiiaaioii	<u> </u>				0.0086 V <sub>12</sub> - 0		· • /
evel of S		+ 0 0078 \/ -	1 006271			R - 4.202 ·	0.0000 V <sub>12</sub> - 0	L <sub>D</sub>	
<b>Level of S</b> D <sub>R</sub> = 5.4	475 + 0.00734 \	<sub>R</sub> + 0.0078 V <sub>12</sub> -	0.00627 L <sub>A</sub>		h - (-	- ( '/  \			
D <sub>R</sub> = $5.4$	475 + 0.00734 \ (pc/mi/ln)	<sub>R</sub> + 0.0078 V <sub>12</sub> -	0.00627 L <sub>A</sub>			oc/mi/ln)			
D <sub>R</sub> = 5.4 $D_R$ = 28.2 (OS = D (Ex	475 + 0.00734 \ (pc/mi/ln) xhibit 13-2)		J.00627 L <sub>A</sub>		LOS = (E	Exhibit 13-2)			
D <sub>R</sub> = 5.4 $D_R$ = 28.2 (OS = D (Ex	475 + 0.00734 \ (pc/mi/ln)		J.00627 L <sub>A</sub>		LOS = (E	•	ion		
D <sub>R</sub> = 5.4 O <sub>R</sub> = 28.2 ( OS = D (Ex	475 + 0.00734 \(pc/mi/ln)\) xhibit 13-2)		J.00627 L <sub>A</sub>		LOS = (E Speed D	Exhibit 13-2)	ion		
D <sub>R</sub> = 5.4 OS = 0 (Ex <b>Speed Det</b> 1 <sub>S</sub> = 0.404	475 + 0.00734 v (pc/mi/ln) xhibit 13-2) <b>terminatio</b> 4 (Exibit 13-11)	n	J.00627 L <sub>A</sub>		LOS = (E <b>Speed L</b> D <sub>s</sub> = (E	xhibit 13-2) <b>Determinat</b>			
$D_{R} = 5.4$ $D_{R} = 28.2$ $D_{S} = 0$ $D_{S} = 0$ $D_{S} = 0.404$ $D_{S} = 0.404$ $D_{S} = 0.404$	475 + 0.00734 v (pc/mi/ln) xhibit 13-2) etermination 4 (Exibit 13-11) mph (Exhibit 13	<b>n</b> -11)	J.00627 L <sub>A</sub>		$\begin{array}{c} LOS = & (E \\ \textbf{Speed} \ \textbf{L} \\ D_{S} = & (E \\ S_{R} = & m \end{array}$	Exhibit 13-2)  Determinat  Exhibit 13-12)	2)		
D <sub>R</sub> = 5.4 D <sub>R</sub> = 28.2 (OS = D (Ex Speed Det M <sub>S</sub> = 0.404 S <sub>R</sub> = 55.7 (OS = D (AS	475 + 0.00734 v (pc/mi/ln) xhibit 13-2) <b>terminatio</b> 4 (Exibit 13-11)	<b>n</b> -11) 11)	J.00627 L <sub>A</sub>		$\begin{array}{c} \text{LOS} = & \text{(E} \\ \textbf{Speed L} \\ \text{D}_{\text{S}} = & \text{(E} \\ \text{S}_{\text{R}} = & \text{m} \\ \text{S}_{0} = & \text{m} \end{array}$	Exhibit 13-2)  Determinat Exhibit 13-12)  ph (Exhibit 13-1	2) 2)		

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	4090-Lo Park	ong Point to Island
Date Performed	7/25/2014		Jurisdiction		
Analysis Time Period	AM Peak		Analysis Year	2018 Βι Site	ıild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	☐ Plar	nning Data
Flow Inputs					
Volume, V AADT	3993	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 11	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length	Level mi	
			Up/Down %		
Calculate Flow Adjus					
$f_p$	1.00		$E_R$	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] 0.948	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		$f_{LC}$		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	65.0	mph	FFS	65.0	mph
Base free-flow Speed, BFFS		mph			•
LOS and Performanc	e Measures	3	Design (N)		
			Design (N)		
Operational (LOS)	M f		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x I)$	N X T <sub>HV</sub> 2340	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	
x f <sub>p</sub> )	50.5		$x f_p$ )		pc/h/ln
S	52.5	mph	s		mph
D = v <sub>p</sub> / S	44.6	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	E		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed			f Evhibit 11.0
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>n</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18	11 0	TRD - Page 11-1
speed	la		LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-∠,	
DDHV - Directional design	nour volume		1-0		

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	4090-Lo Park	ong Point to Island
Date Performed	7/25/2014		Jurisdiction	rank	
Analysis Time Period	PM Peak		Analysis Year	2018 Βι Site	ıild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	☐ Plar	nning Data
Flow Inputs					
Volume, V AADT	3269	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 11	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length	Level mi	
70.51 X 10 X		VOII/II	Up/Down %	****	
Calculate Flow Adjus	tments				
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.948	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		$f_{LC}$		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	65.0	mph	FFS	65.0	mph
Base free-flow Speed, BFFS		mph			r
LOS and Performanc	e Measures	<del></del>	Design (N)		
			Design (N)		
Operational (LOS)			Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x)$	N x t <sub>HV</sub> 1916	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>uv</sub>	
x t <sub>p</sub> )		·	x f <sub>p</sub> )	П	pc/h/ln
S	61.2	mph	s p		mph
$D = v_p / S$	31.3	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	D		Required Number of Lanes	s, N	·
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed	E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens	ity	$E_{\rm T}$ - Exhibits 11-10, 11-11,		f <sub>LC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate	FFS - Free	e-flow speed	f <sub>n</sub> - Page 11-18	11-13	
LOS - Level of service	BFFS - Ba	ase free-flow	l P	11_2	TRD - Page 11-1
speed	hourvolumo		LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	ı ı-∠,	
DDHV - Directional design	nour volume		1		

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General In	formation	1 AMIL V	- / I I I I I	IP JUNCTI Site Infor						
Analyst	AJR		г	reeway/Dir of Tr		I-526 W	/D			
Agency or Comp				unction			/Б /B Off to Is	land Dark		
ate Performed	•	/2014		urisdiction		4100-11	ID OII to is	ialiu Faik		
analysis Time Pe		Peak		nalysis Year		2018 B	uild - River	Center Site		
	on Navy Base IC		7.	naryolo roar		2010 B	ulia Ttivoi	CONTON CITO		
nputs	,									
Upstream A	di Ramo	Freeway Num	ber of Lanes, N	2					Downstre	am Adi
	_	Ramp Number	of Lanes, N	1					Ramp	
□Yes	□On	Acceleration L	ane Length, L <sub>A</sub>						□Yes	On
✓ No	Off	1	ane Length L <sub>D</sub>	775					✓ No	Off
		Freeway Volui	'	3993						ft on
L <sub>up</sub> =	ft	Ramp Volume		1099					L <sub>down</sub> =	11
V,, =	veh/h		Flow Speed, $S_{FF}$	65.0					V <sub>D</sub> =	veh/h
*u	VCII/II	Ramp Free-Fl	ow Speed, S <sub>FR</sub>	25.0					ט	
Conversio	n to pc/h Un	der Base (	Conditions							
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		$f_{HV}$	f <sub>p</sub>	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>
reeway	3993	0.90	Level	11	0	0.9	948	1.00	4	 381
Ramp	1099	0.90	Level	10	0	$\neg$	952	1.00	1:	282
JpStream										
DownStream										
		Merge Areas			=			Diverge Areas		
stimation	of V <sub>12</sub>				Estimat	ion o	f v <sub>12</sub>			
	$V_{12} = V_{F}$	(P <sub>FM</sub> )					V <sub>12</sub> =	$V_R + (V_F - V_F)$	R)P <sub>FD</sub>	
EQ =	(Equa	ation 13-6 or	13-7)		L <sub>EQ</sub> =		(1	Equation 13-1	2 or 13-13	3)
= FM =	using	Equation (E	xhibit 13-6)		P <sub>FD</sub> =		1.	000 using Equ	uation (Exh	ibit 13-7)
12 =	pc/h	, , ,	,		V <sub>12</sub> =			681 pc/h	(	,
or V <sub>av34</sub>	•	(Equation 13-	-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>			pc/h (Equatio	n 13-14 o	r 13-17)
	2,700 pc/h?					> 2.7		Yes ☑ No	11 10 11 0	1 10 17)
	1.5 * V <sub>12</sub> /2							Yes ✓ No		
0 0,01			-16, 13-18, or		"			oc/h (Equation	13-16 13	-18 or 13
Yes,V <sub>12a</sub> =	13-19	: •	10, 10 10, 01		If Yes,V <sub>12a</sub> =			9)	10 10, 10	10, 01 10
Capacity C	hecks				Capacit	y Che	ecks			
	Actual	С	apacity	LOS F?			Actual	Ca	pacity	LOS F
					V <sub>F</sub>		4681	Exhibit 13-8	4700	No
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$	- V <sub>R</sub>	3399	Exhibit 13-8	4700	No
10					V <sub>R</sub>	- 1	1282	Exhibit 13-1	1900	No
low Entor	ring Merge II	afluonco A	<u>roa</u>		_	torin		rge Influen		1
TOW LITTE	Actual		Desirable	Violation?	I TOW LI	_	Actual	Max Desirab		Violation
V <sub>R12</sub>	7100001	Exhibit 13-8	30011 43010	Violation:	V <sub>12</sub>	$\overline{}$	681	Exhibit 13-8	4400:All	Yes
	ervice Deteri		f not E)		+			terminatio		
									<u> </u>	Γ)
	+ 0.00734 v <sub>R</sub> +	0.0076 V <sub>12</sub> -	0.00627 L <sub>A</sub>					.0086 V <sub>12</sub> - 0.	009 LD	
$_{R}$ = (pc/m					l ''	7.5 (pc/	,			
	bit 13-2)				_	•	oit 13-2)			
Speed Det	ermination				Speed L					
N <sub>S</sub> = (Exib	it 13-11)				$D_s = 0.$	673 (E	xhibit 13-	-12)		
	Exhibit 13-11)				S <sub>R</sub> = 49	9.5 mph	(Exhibit	13-12)		
R= mph (	•				$S_0 = N_0$	A mph	(Exhibit	13-12)		
$t_{R} = mph (l)$	Exhibit 13-11) Exhibit 13-13)					-	(Exhibit )	•		

F-4025

	f <sub>p</sub> 1.00 1.00	✓ No L <sub>down</sub> =	On Off ft veh/h			
Agency or Company Date Performed         Atkins         Junction         4100-WB Off to Isla Durisdiction           Analysis Time Period         PM Peak         Analysis Year         2018 Build - River Offer Project Description           Analysis Time Period         PM Peak         Analysis Year         2018 Build - River Offer Project Description           Upstream Adj Ramp         Freeway Number of Lanes, N         1           □ Yes         On         Acceleration Lane Length, L <sub>A</sub> □ No         Off         Deceleration Lane Length L <sub>D</sub> 775           Freeway Free-Flow Speed, S <sub>FF</sub> 3269           Upstream Volume, V <sub>F</sub> 3269           Vu = veh/h         Ramp Free-Flow Speed, S <sub>FF</sub> 65.0           Ramp Free-Flow Speed, S <sub>FF</sub> 65.0           Ramp Free-Flow Speed, S <sub>FF</sub> 25.0           Conversion to pc/h Under Base Conditions           (pc/h)         V(vh/hr)         PHF         Terrain         %Truck         %RV         fHV           Freeway 3269         0.90         Level         11         0         0.948         Ramp           Ramp DownStream         No         Estimation of V12         Estimation of V12         FEQ         FEQ         FFD         1.0           V <sub>12</sub> = V <sub>F</sub> (F <sub>F</sub>	f <sub>p</sub> 1.00 1.00	Ramp  Yes  No  L <sub>down</sub> =  V <sub>D</sub> =	On Off ft veh/h			
Date   Performed   7/25/2014   Jurisdiction   Analysis Time   Period   PM   Peak   PM   PM   PM   PM   PM   PM   PM   P	f <sub>p</sub> 1.00 1.00	Ramp  Yes  No  L <sub>down</sub> =  V <sub>D</sub> =	On Off ft veh/h			
Analysis Time Period	f <sub>p</sub> 1.00 1.00	Ramp  Yes  No  L <sub>down</sub> =  V <sub>D</sub> =	On Off ft veh/h			
Project Description	f <sub>p</sub> 1.00 1.00	Ramp  Yes  No  L <sub>down</sub> =  V <sub>D</sub> =	On Off ft veh/h			
	1.00 1.00	Ramp  Yes  No  L <sub>down</sub> =  V <sub>D</sub> =	On Off ft veh/h			
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	1.00 1.00	Ramp  Yes  No  L <sub>down</sub> =  V <sub>D</sub> =	On Off ft veh/h			
Ramp Number of Lanes, N 1  Acceleration Lane Length, $L_A$ Deceleration Lane Length, $L_A$ Deceleration Lane Length, $L_A$ $L_{up} = ft$ Ramp Volume, $V_F$ Saces $V_u = veh/h$ Freeway Free-Flow Speed, $S_{FF}$ Ramp Free-Flow Speed, $S_{FF}$ Ramp Free-Flow Speed, $S_{FF}$ Ramp Free-Flow Speed, $S_{FF}$ Saces $V_U = veh/h$ Freeway Free-Flow Speed, $S_{FF}$ Ramp Free-Flow Speed, $S_{FF}$ Saces $V_U = veh/h$ Freeway Free-Flow Speed, $S_{FF}$ Saces $V_U = veh/h$ Freeway Free-Flow Speed, $S_{FF}$ Saces $V_U = veh/h$ Freeway Free-Flow Speed, $V_{FF}$ Ramp Free-Flow Speed, $V_{FF}$ Saces $V_U = veh/h$ Freeway Free-Flow Speed, $V_{FF}$ Saces $V_U = veh/h$ Saces $V_U = veh/h$ Freeway Free-Flow Speed, $V_U = veh/h$ Saces  Saces $V_U = veh/h$ Saces	1.00 1.00	Ramp  Yes  No  L <sub>down</sub> =  V <sub>D</sub> =	On Off ft veh/h			
☐ Yes         On         Acceleration Lane Length, L <sub>A</sub> Deceleration Lane Length L <sub>D</sub> 775           Image: Freeway Freeway Freeway Freeway Freeway Free-Flow Speed, S <sub>FF</sub> Ramp Free-Flow Speed, S <sub>FR</sub> Ramp Free-Flow Speed, S <sub>FR</sub> 25.0         595           Conversion to pc/h Under Base Conditions           (pc/h)         V (Veh/hr)         PHF         Terrain         %Truck         %Rv         f <sub>HV</sub> Freeway         3269         0.90         Level         11         0         0.948           Ramp         595         0.90         Level         16         0         0.926           UpStream         Down Stream         Din           Estimation of v <sub>12</sub> Estimation of v <sub>12</sub> Equation 13-6 or 13-7)         L <sub>EQ</sub> = (Equation 13-6 or 13-7)         L <sub>EQ</sub> = (Equation 13-6 or 13-7)         V <sub>12</sub> = 383           V <sub>12</sub> = v <sub>2</sub> /r         P <sub>FM</sub> = using Equation (Exhibit 13-6)         P <sub>FD</sub> = 1.00         1.00           Is V <sub>3</sub> or V <sub>av34</sub> > 2,700 pc/h? ☐ yes ☐ No         Is V <sub>3</sub> or V <sub>av34</sub> > 2,700 pc/h? ☐ yes ☐ No         Is V <sub>3</sub> or V <sub>av34</sub> > 2,700 pc/h? ☐ yes ☐ No         Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 * V <sub>12</sub> /2         Y <sub>12</sub> = P <sub>19</sub> Capacity Checks           Actual         Capacity         LOS F?         Actual	1.00 1.00	Yes  VD No  VD =  V = V/PHF x  383	Off ft veh/h  c f <sub>HV</sub> x f <sub>p</sub> 2			
No	1.00 1.00	$V$ No $V_{down} = V_{D} = V = V/PHF x 383:$	Off ft veh/h  c f <sub>HV</sub> x f <sub>p</sub> 2			
	1.00 1.00	$L_{down} = V_D = V = V/PHF \times 383$	ft veh/h x f <sub>HV</sub> x f <sub>p</sub> 2			
L <sub>up</sub> = ft       Ramp Volume, V <sub>R</sub> 595         V <sub>u</sub> = veh/h       Freeway Free-Flow Speed, S <sub>FF</sub> 65.0         Ramp Free-Flow Speed, S <sub>FR</sub> 25.0         Conversion to pc/h Under Base Conditions         (pc/h)       V (Veh/hr)       PHF       Terrain       %Truck       %Rv       f <sub>HV</sub> Freeway       3269       0.90       Level       11       0       0.948         Ramp       595       0.90       Level       16       0       0.926         UpStream       DownStream       Div         DownStream       Merge Areas       Div         Estimation of V <sub>12</sub> V <sub>12</sub> = V <sub>F</sub> (P <sub>FM</sub> )       V <sub>12</sub> = V         P <sub>FM</sub> = using Equation (Exhibit 13-6)       P <sub>FD</sub> = 1.00         V <sub>12</sub> = pc/h       V <sub>12</sub> = 383         V <sub>12</sub> = pc/h       V <sub>12</sub> = 383         V <sub>3</sub> or V <sub>av34</sub> > 2,700 pc/h?	1.00 1.00	$L_{down} = V_D = V = V/PHF \times 383$	ft veh/h x f <sub>HV</sub> x f <sub>p</sub> 2			
Vu =         veh/h         Freeway Free-Flow Speed, S <sub>FR</sub> 25.0         65.0 25.0           Conversion to pc/h Under Base Conditions         Q (yeh/hr)         PHF         Terrain         %Truck         %Rv         f <sub>HV</sub> Freeway         3269         0.90         Level         11         0         0.948           Ramp         595         0.90         Level         16         0         0.926           UpStream         DownStream         DownStream         DownStream         DownStream         DownStream           Estimation of V12         Estimation of V12         Estimation of V12           LeQ =         (Equation 13-6 or 13-7)         LeQ =         (Equation 13-6 or 13-7)         LeQ =         LeQ =         (Equation 13-6 or 13-7)         V12 =         No         V12 =         383           V3 or Vav34         pc/h         (Equation 13-14 or 13-17)         V3 or Vav34         V3 or Vav34         2,700 pc/h? PS         No         Is V3 or Vav34         2,700 pc/h? PS         Is V3 or Vav34         2,700 pc/h? PS         Is V3 or Vav34         1.5 * V12/2         PC           Cap	1.00 1.00	$V_D = V = V/PHF \times 383$	veh/h x f <sub>HV</sub> x f <sub>p</sub>			
Conversion to pc/h Under Base Conditions           (pc/h)         V (Veh/hr)         PHF         Terrain         %Truck         %Rv         fHV           Freeway         3269         0.90         Level         11         0         0.948           Ramp         595         0.90         Level         16         0         0.926           UpStream         DownStream         DownStream         Div           Estimation of V12           UpStream           V12 = VF (PFM)         V12 = VF           Estimation of V12           Estimation of V12           Estimation of V12           UpStream           V12 = VF (PFM)           V12 = VF (PFM)         V12 = VF           UpStream         V12 = VF           UpStream         V12 = VF         V12 =	1.00 1.00	v = V/PHF x 3833	x f <sub>HV</sub> x f <sub>p</sub>			
Ramp Free-Flow Speed, S <sub>FR</sub>   25.0	1.00 1.00	v = V/PHF x 3833	x f <sub>HV</sub> x f <sub>p</sub>			
Copumble	1.00 1.00	383	2			
(pc/h)         V (Veh/hr)         PHF         Terrain         %Truck         %Rv         f <sub>HV</sub> Freeway         3269         0.90         Level         11         0         0.948           Ramp         595         0.90         Level         16         0         0.926           UpStream         DownStream         DownStream         DownStream         Estimation of v <sub>12</sub> LeQ = (Equation 13-6 or 13-7)           LeQ = (Equation 13-6 or 13-7)           V <sub>12</sub> = 0           V <sub>12</sub> = 0         0	1.00 1.00	383	2			
Ramp   S95   0.90   Level   11   0   0.948	1.00 verge Areas					
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	verge Areas	714	1			
DownStream         Div           Estimation of $V_{12}$ V <sub>12</sub> = V <sub>F</sub> (P <sub>FM</sub> )         Estimation of $V_{12}$ V <sub>12</sub> = V <sub>F</sub> (P <sub>FM</sub> )         V <sub>12</sub> = V           V <sub>2</sub> = (Equation 13-6 or 13-7)         V <sub>2</sub> = (Equation 13-7)           V <sub>2</sub> = (Equation 13-6 or 13-7)         V <sub>2</sub> = (Equation 13-7)           V <sub>12</sub> = (Equation 13-14 or 13-17)         V <sub>12</sub> = (Equation 13-14 or 13-17)           V <sub>3</sub> or V <sub>av34</sub> > 2,700 pc/h?						
Estimation of $v_{12}$   V <sub>12</sub> = V <sub>F</sub> (P <sub>FM</sub> )   V <sub>12</sub> = V <sub>F</sub> (Equation 13-6 or 13-7)   V <sub>12</sub> =						
$V_{12} = V_F (P_{FM}) $ $V_{12} = V_F (P_{FM$	/_ + (\/ \/					
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$V_{12} = V_R + (V_F - V_R)P_{FD}$					
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$						
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	quation 13-1	2 or 13-13)				
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	00 using Equ	uation (Exhibi	it 13-7)			
	2 pc/h					
Is $V_3$ or $V_{av34} > 1.5 * V_{12}/2$	c/h (Equatio	on 13-14 or 1	13-17)			
f Yes, V <sub>12a</sub> = pc/h (Equation 13-16, 13-18, or 13-19)    F Yes, V <sub>12a</sub> = pc/h (Equation 13-16, 13-18, or 19)   Capacity Checks   Capacity   LOS F?   Actual   V <sub>F</sub> 3832	Yes ☑ No					
f Yes, V <sub>12a</sub> = pc/h (Equation 13-16, 13-18, or 13-19)    F Yes, V <sub>12a</sub> = pc/h (Equation 13-16, 13-18, or 19)   Capacity Checks   Capacity   LOS F?   Actual   V <sub>F</sub> 3832	Yes ☑ No					
Capacity Checks         Capacity Checks           Actual         Capacity         LOS F?         Actual           V <sub>F</sub> 3832		13-16, 13-1	8, or 13-			
Actual Capacity LOS F? Actual V <sub>F</sub> 3832						
V <sub>F</sub> 3832	1 0-		Tuon F			
	Exhibit 13-8	pacity 4700	LOS F			
$V_{EO}$   Exhibit 13-8    $V_{EO} = V_E - V_B I$ 3118	-		No			
	Exhibit 13-8		No			
V <sub>R</sub> 714	Exhibit 13-1		No			
Flow Entering Merge Influence Area Flow Entering Diverg						
Actual Max Desirable Violation? Actual	Max Desirat		Violation			
1712	Exhibit 13-8	4400:All	No			
Level of Service Determination (if not F)  Level of Service Determination			)			
$D_R = 5.475 + 0.00734 \text{ v}_R + 0.0078 \text{ V}_{12} - 0.00627 \text{ L}_A$ $D_R = 4.252 + 0.00627 \text{ L}_A$	1086 V <sub>12</sub> - 0.	009 L <sub>D</sub>				
$D_R = (pc/mi/ln)$ $D_R = 30.2 (pc/mi/ln)$						
OS = (Exhibit 13-2) LOS = D (Exhibit 13-2)						
Speed Determination Speed Determination	า					
$M_{\rm S}$ = (Exibit 13-11) $D_{\rm S}$ = 0.622 (Exhibit 13-1	2)					
$S_R = mph (Exhibit 13-11)$ $S_R = 50.7 mph (Exhibit 13-11)$						
$S_0$ = mph (Exhibit 13-11) $S_0$ = N/A mph (Exhibit 13	3-12)					
S = mph (Exhibit 13-13)	-					
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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	4105 - I. On	s. Pk Off to Is. Pk
Date Performed	7/25/2014		Jurisdiction	On	
Analysis Time Period	AM Peak		Analysis Year	2018 Βι Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	☐ Plar	nning Data
Flow Inputs					
Volume, V AADT	2894	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 11	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length	Level mi	
			Up/Down %		
Calculate Flow Adjus	tments				
$f_p$	1.00		$E_R$	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] <i>0.948</i>	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	65.0	mph	FFS	65.0	mph
Base free-flow Speed, BFFS		mph			,
LOS and Performanc	e Measures	3	Design (N)		
0			Design (N)		
Operational (LOS)	NI v. £		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x I)$	1696 N X I <sub>HV</sub>	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	
x f <sub>p</sub> )	62.0	ma m la	x f <sub>p</sub> )		pc/h/ln
S	63.8	mph	s		mph
$D = v_p / S$	26.6	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	D		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed	E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens	sity	$E_{\rm T}$ - Exhibits 11-10, 11-11,		f <sub>LC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate	FFS - Free	e-flow speed	$f_{\rm n}$ - Page 11-18	11-10	
LOS - Level of service	BFFS - Ba	ase free-flow	F	11_2	TRD - Page 11-1
speed	hourvolumo		LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	ı ı- <u>८</u> ,	
DDHV - Directional design	riour volume		<u> </u>		

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>I-526 W</i>	/B
Agency or Company	Atkins		From/To	4105 - I	s. Pk Off to Is. Pk
Date Performed	7/25/2014		Jurisdiction	On	
Analysis Time Period	PM Peak		Analysis Year	2018 Βι Site	uild - River Center
Project Description Navy	Base ICTF			0.10	
✓ Oper.(LOS)			Pes.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	2674	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 11	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi	
Calculate Flow Adjus	tments		·		
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1)10.948	
Speed Inputs			Calc Speed Adj and		
Lane Width		ft	Guio Opoca / (a) una		
Rt-Side Lat. Clearance		ft	f		mnh
Number of Lanes, N	2	10	f <sub>LW</sub>		mph
Total Ramp Density, TRD	_	ramps/mi	f <sub>LC</sub>		mph
FFS (measured)	65.0	mph	TRD Adjustment		mph
Base free-flow Speed,	00.0	·	FFS	65.0	mph
BFFS		mph			
LOS and Performanc	e Measures	<b>S</b>	Design (N)		
On anotion of (LOC)			Design (N)		
Operational (LOS)	N v f		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x)$ $x f_p$	11 X 1 <sub>HV</sub> 1567	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	pc/h/ln
S	64.6	mph	x f <sub>p</sub> ) S		mph
$D = v_p / S$	24.3	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	С		Required Number of Lanes	s, N	ролпілії
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed			f Evhibit 11.0
V - Hourly volume	D - Dens		$E_{R}$ - Exhibits 11-10, 11-12 $E_{T}$ - Exhibits 11-10, 11-11,		f <sub>LW</sub> - Exhibit 11-8
v <sub>n</sub> - Flow rate		e-flow speed	<b>1</b> '	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		se free-flow	f <sub>p</sub> - Page 11-18	11.2	TRD - Page 11-11
speed DDHV - Directional design	hour volume		LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	ı ı-∠,	

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		RAI	MPS AND	RAMP JUNG	CTIONS W	ORKSHE	ET				
Genera	l Infori				Site Infor						
Analyst		AJR		Fr	eeway/Dir of Tr	avel I	-526 WB				
Agency or C		Atkins		Ju	nction	4	4110-WB O	n from Isl	and Park Dr		
Date Perfor		7/25/2			risdiction						
Analysis Tin		AM P		Ar	nalysis Year		2018 Build -	River Ce	enter Site		
	cription	Navy Base ICT	<del>-</del>								
Inputs			l	hanafi anaa Ni	0						
Jpstream A	dj Ramp		1 '	ber of Lanes, N	2					Downstre	am Adj
Yes	On		Ramp Numbe	•	1					Ramp	
res			Acceleration L	ane Length, L <sub>A</sub>	1400					□Yes	On
✓ No	Off		Deceleration L	ane Length L <sub>D</sub>						☑ No	Off
			Freeway Volui	me, V <sub>F</sub>	2894					INO	
_ <sub>up</sub> =	ft		Ramp Volume	, V <sub>R</sub>	543					L <sub>down</sub> =	ft
			Freeway Free	-Flow Speed, S <sub>FF</sub>	65.0						vob/b
/ <sub>u</sub> =	veh/h		ı	ow Speed, S <sub>ER</sub>	45.0					V <sub>D</sub> =	veh/h
Conver	sion to			Conditions							
	Ī	\ \ \			0/ TI-	0/ D	1		£		
(pc/l	11)	(Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>		f <sub>p</sub>	v – v/PH	x f <sub>HV</sub> x f <sub>p</sub>
Freeway		2894	0.90	Level	11	0	0.948		1.00	3	3392
Ramp		543	0.90	Level	6	0	0.971		1.00		621
UpStream							-				
DownStrea	ım [		Morgo Aroso					Div	erge Areas		
Merge Areas  Estimation of v <sub>12</sub>						Estimati	on of v		ige Aleas		
			<u> </u>						0.4		
		$V_{12} = V_{F}$					V		+ (V <sub>F</sub> - V <sub>R</sub>		
EQ =			ation 13-6 or			L <sub>EQ</sub> =		(Ed	quation 13-	12 or 13-1	3)
P <sub>FM</sub> =		1.000	using Equat	ion (Exhibit 13-6)		P <sub>FD</sub> =		usi	ng Equatio	n (Exhibit 1	3-7)
/ <sub>12</sub> =		3392 p	oc/h			V <sub>12</sub> =		pc/	h		
$V_3$ or $V_{av34}$		0 pc/ł	n (Equation	13-14 or 13-17)		$V_3$ or $V_{av34}$		pc/	n (Equation 1	3-14 or 13-1	7)
Is $V_3$ or $V_{av}$	<sub>/34</sub> > 2,700	) pc/h?	s 🗹 No			Is V <sub>3</sub> or V <sub>av3</sub>	<sub>4</sub> > 2,700 p	c/h? 🔲 \	′es 🗌 No		
Is V <sub>3</sub> or V <sub>av</sub>	<sub>/34</sub> > 1.5 *	V <sub>12</sub> /2 □ Yes	s 🗹 No			Is V <sub>3</sub> or V <sub>av3</sub>	<sub>4</sub> > 1.5 * V <sub>1</sub>	2/2 🔲 \	′es □ No		
f Yes,V <sub>12a</sub> :	=		(Equation 13	3-16, 13-18, or		If Yes,V <sub>12a</sub> =		pc/	h (Equation	า 13-16, 1	3-18, or
		13-19)						13-1	9)		
Capacit	y Cne		1 ^		1 100 50	Capacity				11	1 100 50
		Actual		apacity	LOS F?	\ \/		ctual		acity	LOS F?
						V <sub>F</sub>			Exhibit 13-8	_	
V <sub>F</sub>	o	4013	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>		Exhibit 13-8		
						V <sub>R</sub>			Exhibit 13- 10	•	
Flow Fr	ntorino	Merge In	fluence A	roa		Flow En	torina [	)ivora		co Aros	
10W LI	rtering 	Actual		Desirable	Violation?	I TOW LIT	Actua		Max Desi		Violation
V <sub>R1</sub>		4013	Exhibit 13-8	4600:All	No	V <sub>12</sub>	7.0.00	_	xhibit 13-8		510.1011
evel of	f Sanvi	ce Detern			1	Level of	Service			n (if not	<i>F</i> )
		0.00734 v <sub>R</sub> + 0							)86 V <sub>12</sub> - 0.		• /
				70021 L <sub>A</sub>		1		0.00	12 - 0.	000 LD	
	7.7 (pc/mi	· ·					c/mi/ln)	0)			
	(Exhibit 1	•					xhibit 13-				
Speed L	Determ	ination				Speed D					
$M_S = 0$	.411 (Exib	it 13-11)				,	xhibit 13-12	•			
$S_R = 5$	5.6 mph (I	Exhibit 13-11)				S <sub>R</sub> = mp	oh (Exhibit 1	3-12)			
	I/A mnh (F	xhibit 13-11)				$S_0 = mp$	h (Exhibit 1	3-12)			
> <sub>0</sub> = N	.,, , ,,,,b,,, ,=										
0		Exhibit 13-13)				1 *	h (Exhibit 1	3-13)			

	RAI	MPS AND	RAMP JUN	CTIONS W	ORKSHE	ET				
General Info				Site Infor						
Analyst	AJR		Fr	eeway/Dir of Tr	avel	I-526 WB				
Agency or Company	/ Atkin	S	Ju	nction	4	4110-WB (	On from Is	land Park Dr		
Date Performed	7/25/	2014	Ju	risdiction						
Analysis Time Perio			Ar	nalysis Year		2018 Build	- River C	enter Site		
Project Description	Navy Base ICT	ΓF								
nputs		1								
Jpstream Adj Ramp	)	1 '	ber of Lanes, N	2					Downstre	am Adj
		Ramp Numbe	r of Lanes, N	1					Ramp	
Yes O	n	Acceleration L	ane Length, L <sub>A</sub>	1400					Yes	On
☑No ☐O	ff	Deceleration L	ane Length L <sub>D</sub>						✓No	_
		Freeway Volu	me, V <sub>F</sub>	2674					<b>™</b> INO	Off
<sub>rup</sub> = ft		Ramp Volume	, V <sub>D</sub>	630					L <sub>down</sub> =	ft
			-Flow Speed, S <sub>FF</sub>	65.0						
$t_{\rm u} = {\rm veh/l}$	n	1	ow Speed, S <sub>FR</sub>	45.0					$V_D =$	veh/h
Conversion	to no/h lln		. 117	45.0						
Conversion	V PC/II UIIC					т —				
(pc/h)	(Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	·	f <sub>p</sub>	v = V/PHF	$x f_{HV} x f_{p}$
Freeway	2674	0.90	Level	11	0	0.948		1.00	3	3135
Ramp	630	0.90	Level	5	0	0.976		1.00		718
UpStream										
DownStream										
		Merge Areas			F 41 41		Div	erge Areas		
Estimation o	f V <sub>12</sub>				Estimati	on of v	12			
	V <sub>12</sub> = V <sub>F</sub>	(P <sub>FM</sub> )				,	V <sub>12</sub> = V <sub>E</sub>	+ (V <sub>F</sub> - V <sub>R</sub> )	P <sub>FD</sub>	
. <sub>EQ</sub> =	(Equa	ation 13-6 or	13-7)		L <sub>EQ</sub> =		(E	quation 13-	12 or 13-1	3)
P <sub>FM</sub> =			ion (Exhibit 13-6)		P <sub>FD</sub> =			ing Equatio		
/ <sub>12</sub> =	3135		,		V <sub>12</sub> =		рс		,	,
/ <sub>3</sub> or V <sub>av34</sub>			13-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>			h (Equation 1	3-14 or 13-1	7)
ls V <sub>3</sub> or V <sub>av34</sub> > 2,7	-		10-14-01-10-17)			> 2 700 ;		Yes □ No	0 14 01 10 1	')
Is $V_3$ or $V_{av34} > 2.7$					0 0.0	•		res □ No Yes □ No		
			3-16, 13-18, or					res ⊟ No /h (Equatior	13_16_1	3_18 or
Yes,V <sub>12a</sub> =	13-19)		)-10, 10-10, 0i		If Yes,V <sub>12a</sub> =		13-1		1 10-10, 1	0-10, OI
Capacity Ch	ecks				Capacity	/ Chec	ks	•		
	Actual	C	apacity	LOS F?			Actual	Сар	acity	LOS F?
					V <sub>F</sub>			Exhibit 13-8	3	
$V_{FO}$	3853	Exhibit 13-8		No	V <sub>FO</sub> = V <sub>F</sub>	- V <sub>R</sub>		Exhibit 13-8	3	
- FO		LAIIIDIC 10 0		"				Exhibit 13-		
					V <sub>R</sub>			10		
low Enterin	g Merge In	fluence A	rea		Flow En	tering	Diverg	e Influen		
	Actual		Desirable	Violation?		Actu		Max Desi	rable	Violation'
$V_{R12}$	3853	Exhibit 13-8	4600:AII	No	V <sub>12</sub>			Exhibit 13-8		
Level of Serv	vice Detern	nination (	if not F)		Level of	Servic	e Dete	rminatio	n (if not	F)
$D_{R} = 5.475 -$	+ 0.00734 v <sub>R</sub> + 0	0.0078 V <sub>12</sub> - 0.0	00627 L <sub>A</sub>		[	$O_{R} = 4.25$	52 + 0.00	086 V <sub>12</sub> - 0.	009 L <sub>D</sub>	
$O_{R} = 26.4 \text{ (pc/r)}$	ni/ln)				$D_R = (p)$	c/mi/ln)				
OS = C (Exhibi	· ·					xhibit 13	-2)			
Speed Deter					Speed D					
-					<del>  '</del>	xhibit 13-1				
•	ibit 13-11)				, ·		•			
	(Exhibit 13-11)				I	oh (Exhibit				
	(Exhibit 13-11)				ľ	oh (Exhibit				
s = 56.3 mph	(Exhibit 13-13)				S = mp	oh (Exhibit	13-13)			
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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>I-526 Wi</i>	В
Agency or Company	Atkins		From/To	4120-	arktoClementsFerry
Date Performed	7/25/2014		Jurisdiction	isiaiiur	arktociementsi erry
Analysis Time Period	AM Peak		Analysis Year	2018 Bu Site	ild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			es.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	3437	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 10	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length Up/Down %	Level mi	
Calculate Flow Adjus	tmonte		Op/Down 70		
				4.0	
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$		
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		$f_{LC}$		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	65.0	mph	FFS	65.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performanc	e Measures	3	Design (N)		
			Design (N)		
Operational (LOS)	NI 6		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x)$	N X <sup>†</sup> HV 2005	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	
x f <sub>p</sub> )			x f <sub>p</sub> )	111	pc/h/ln
S	59.8	mph	S		mph
$D = v_p / S$	33.5	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	D		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed			f = Evb:bit 44 0
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>p</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	, 11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18	11.0	TRD - Page 11-1
speed			LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-2,	
DDHV - Directional design	nour volume		1 1-0		

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	l <i>I-526 WE</i>	3
Agency or Company	Atkins		From/To	4120-	white Champanta Faura
Date Performed	7/25/2014		Jurisdiction	isiandPa	rktoClementsFerry
Analysis Time Period	PM Peak		Analysis Year	2018 Bui Site	ild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plan	ning Data
Flow Inputs					
Volume, V AADT	3304	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 9	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi	
Calculate Flow Adjus	tments		·		
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)1 <i>0.957</i>	
Speed Inputs			Calc Speed Adj and		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f <sub>LW</sub>		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	65.0	mph	FFS	65.0	mph
Base free-flow Speed, BFFS		mph		05.0	тірп
LOS and Performance	e Measures	<del></del>	Design (N)		
Operational (LOS) v <sub>p</sub> = (V or DDHV) / (PHF x N	N x f		Design (N) Design LOS		
x f <sub>p</sub> )		pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x x f_p)$	N x f <sub>HV</sub>	pc/h/ln
S D = v / S	61.2	mph	S		mph
$D = v_p / S$	31.3	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	D		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed DDHV - Directional design l	BFFS - Ba		$E_R$ - Exhibits 11-10, 11-12 $E_T$ - Exhibits 11-10, 11-11, $f_p$ - Page 11-18 LOS, S, FFS, $v_p$ - Exhibits 11-3		f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-11

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	RAMF	S AND RAM	IP JUNCTI	ONS WC	RKS	HEET				
General Information			Site Infor							
Analyst AJ	R	Fr	reeway/Dir of Tr	avel	I-526 V	VB				
Agency or Company Atl			unction	4130-WE		VB Off to C	lements Ferry			
	5/2014		urisdiction							
	l Peak	Aı	nalysis Year		2018 B	uild - Rive	Center Site			
Project Description Navy Base I	CTF									
Inputs	[NN	when of Lance NI								
Upstream Adj Ramp	1 '	nber of Lanes, N	2					Downstrea	am Adj	
□Yes □On	1 '	er of Lanes, N	1					Ramp		
☐ Yes ☐ On	Acceleration	Lane Length, L <sub>A</sub>						□Yes	On	
☑ No ☐ Off	Deceleration	Lane Length L <sub>D</sub>	240					✓ No	Off	
	Freeway Volu	ume, V <sub>F</sub>	3437					I № INO		
$L_{up} = ft$	Ramp Volum	e, V <sub>D</sub>	444					L <sub>down</sub> =	ft	
•		e-Flow Speed, S <sub>FF</sub>	60.0					.,		
$V_u = veh/h$		Flow Speed, S <sub>ER</sub>	45.0					V <sub>D</sub> =	veh/h	
Conversion to no/h II		111	70.0							
Conversion to pc/h U		Conditions		<u> </u>	$\overline{}$					
(pc/h) (Veh/hr)	PHF	Terrain	%Truck	%Rv		$f_{HV}$	f <sub>p</sub>	v = V/PHF	$x t_{HV} x t_{p}$	
Freeway 3437	0.90	Level	10	0	0.	952	1.00	40	)10	
Ramp 444	0.90	Level	17	0	0.	922	1.00	5	35	
UpStream										
DownStream										
Tatimatian af	Merge Areas			Cational	·:	<u> </u>	Diverge Areas			
Estimation of v <sub>12</sub>				Estimation of v <sub>12</sub>						
V <sub>12</sub> = \	$I_{F}(P_{FM})$			$V_{12} = V_R + (V_F - V_R)P_{FD}$						
- <sub>EQ</sub> = (Eq	uation 13-6 or	r 13-7)		L <sub>EQ</sub> = (Equation 13-12 or 13-13)						
	g Equation (	Exhibit 13-6)		P <sub>FD</sub> =		1.	000 using Eq	uation (Exhi	bit 13-7)	
/ <sub>12</sub> = pc/r	1			V <sub>12</sub> =		40	010 pc/h			
	(Equation 13	3-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>		0	pc/h (Equati	on 13-14 o	· 13-17)	
Is $V_3$ or $V_{av34} > 2,700$ pc/h? $\square \gamma$		,		Is V <sub>3</sub> or V <sub>av34</sub> > 2,700 pc/h? ☐ Yes ☑ No						
Is $V_3$ or $V_{av34} > 1.5 * V_{12}/2 \square \gamma$							☐Yes ☑ No			
and the second s		3-16, 13-18, or					c/h (Equation	13-16, 13	-18. or 13-	
f Yes,V <sub>12a</sub> = pc/r 13-1				If Yes,V <sub>12a</sub> =	=		9)		,	
Capacity Checks				Capacit	ty Ch	ecks				
Actual	(	Capacity	LOS F?			Actual	Ca	apacity	LOS F	
				V <sub>F</sub>		4010	Exhibit 13-	8 4600	No	
V <sub>FO</sub>	Exhibit 13-8			$V_{FO} = V_{F}$	- V <sub>R</sub>	3475	Exhibit 13-	8 4600	No	
				V <sub>R</sub>		535	Exhibit 13-1	0 2100	No	
Flow Entering Merge	Influence	1 Aroa				a Dive	rge Influer			
Actual		Desirable	Violation?	7 7017 27	_	Actual	Max Desira		Violation <sup>6</sup>	
V <sub>R12</sub>	Exhibit 13-8			V <sub>12</sub>	$\neg$	1010	Exhibit 13-8	4400:All	No	
Level of Service Dete				<u> </u>				<u> </u>		
				<b>Level of Service Determination (if not F)</b> $D_{R} = 4.252 + 0.0086  V_{12} - 0.009  L_{D}$						
$D_R = 5.475 + 0.00734 \text{ v}_R + 0.0078 \text{ V}_{12} - 0.00627 \text{ L}_A$							.0000 v <sub>12</sub> - 0	.009 L <sub>D</sub>		
D <sub>R</sub> = (pc/mi/ln)				l .,	6.6 (pc	,				
LOS = (Exhibit 13-2)  LOS = E (Exhibit 13-2)										
Speed Determination				Speed I						
M <sub>S</sub> = (Exibit 13-11)				1 1	.346 (E	xhibit 13	-12)			
M <sub>S</sub> = (Exibit 13-11)					S <sub>R</sub> = 53.8 mph (Exhibit 13-12)					
				$S_R = 5$	3.8 mpr					
$S_R$ = mph (Exhibit 13-11)				1	-	-				
$S_R$ = mph (Exhibit 13-11)				$S_0 = N$	I/A mph	-	13-12)			

		RAMP	S AND RAM	IP JUNCTI	ONS WO	ORKS	SHEET			
General In	formation			Site Infor						
Analyst	AJR		F	reeway/Dir of Tr	avel	I-526	WB			
Agency or Comp	oany Atkin	IS		unction			WB Off to C	lements Ferry		
Date Performed		/2014	-	urisdiction						
Analysis Time Pe			A	nalysis Year		2018	Build - Rive	Center Site		
Project Descripti <b>Inputs</b>	ion Navy Base IC	l F								
•		Erooway Nur	nber of Lanes, N	2						
Upstream A	Adj Ramp	Ramp Number							Downstrea	am Adj
□Yes	On	I '	-	1					Ramp	
		1	Lane Length, LA						Yes	On
✓ No	Off	1	Lane Length L <sub>D</sub>	240					☑ No	Off
		Freeway Volu		3304						ft
L <sub>up</sub> =	ft	Ramp Volume	13	368					L <sub>down</sub> =	IL
V <sub>u</sub> =	veh/h		e-Flow Speed, S <sub>FF</sub>	60.0					V <sub>D</sub> =	veh/h
<b>v</b> u	VCII/II	Ramp Free-F	low Speed, $S_{FR}$	45.0						
Conversio	n to pc/h Un	der Base	Conditions							
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		$f_{HV}$	f <sub>p</sub>	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>
Freeway	3304	0.90	Level	9	0	(	).957	1.00	38	36
Ramp	368	0.90	Level	17	0	(	).922	1.00	44	14
UpStream						+				
DownStream		Merge Areas						Diverge Areas		
Estimation		Weige Aleas			Estimation of v <sub>12</sub>					
		/ D \							' \D	
_	$V_{12} = V_F$		40.7)		$V_{12} = V_R + (V_F - V_R)P_{FD}$					
-EQ =		ation 13-6 or			$L_{EQ}$ = (Equation 13-12 or 13-13) $P_{FD}$ = 1.000 using Equation (Exhibit 13-7)					
P <sub>FM</sub> =	_	Equation (	EXNIDIT 13-6)		P <sub>FD</sub> =				uation (Exhi	bit 13-7)
/ <sub>12</sub> =	pc/h				V <sub>12</sub> =			336 pc/h		
V <sub>3</sub> or V <sub>av34</sub>			-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>			pc/h (Equation	on 13-14 or	13-17)
	2,700 pc/h? ☐ Ye				Is $V_3$ or $V_{av34} > 2,700$ pc/h? $\square$ Yes $\checkmark$ No					
	1.5 * V <sub>12</sub> /2		10 10 10		Is $V_3$ or $V_{av34} > 1.5 * V_{12}/2$ Yes $\checkmark$ No pc/h (Equation 13-16, 13-18, or 13-					
f Yes,V <sub>12a</sub> =	pc/n ( 13-19)		-16, 13-18, or		If Yes,V <sub>12a</sub>	=		ic/n (Equation 9)	1 13-16, 13-	-18, Of 13-
Capacity C		,			Capacit	ty Ch		- /		
	Actual		Capacity	LOS F?			Actual	Ca	apacity	LOS F
					V <sub>F</sub>		3836	Exhibit 13-	8 4600	No
$V_{FO}$		Exhibit 13-8			V <sub>FO</sub> = V <sub>I</sub>	<sub>F</sub> - V <sub>R</sub>	3392	Exhibit 13-	8 4600	No
					V <sub>R</sub>		444	Exhibit 13-1	10 2100	No
Flow Enter	ring Merge In	fluence 4	\rea	1	+ '`			rge Influen		
	Actual		Desirable	Violation?		1	Actual	Max Desira		Violation <sup>6</sup>
V <sub>R12</sub>		Exhibit 13-8			V <sub>12</sub>	$\neg$	3836	Exhibit 13-8	4400:All	No
	ervice Deterr	nination (	if not F)			f Ser	vice De	terminatio	n (if not	F)
	+ 0.00734 v <sub>R</sub> +				Level of Service Determination (if not F)  D <sub>R</sub> = 4.252 + 0.0086 V <sub>12</sub> - 0.009 L <sub>D</sub>					
D <sub>R</sub> = (pc/mi/ln)							c/mi/ln)	12	Ь	
						ibit 13-2)				
· · ·						rminatio	on			
				<del>  '</del>		Exhibit 13				
M <sub>S</sub> = (Exibit 13-11)						-	h (Exhibit			
	Exhibit 13-11)					-		*		
	Exhibit 13-11)					-	(Exhibit	•		
, ,	Exhibit 13-13)						h (Exhibit	•		
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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	4135-Cl On	Ferry Off to CIFerry
Date Performed	7/25/2014		Jurisdiction	On	
Analysis Time Period	AM Peak		Analysis Year	2018 Bu Site	ild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plar	ning Data
Flow Inputs					
Volume, V AADT	2993	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 12	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length	Level mi	
			Up/Down %		
Calculate Flow Adjus			_		
f <sub>p</sub>	1.00		$E_R$	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] 0.943	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		$f_{LC}$		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			r
LOS and Performanc	e Measures	3	Design (N)		
			Design (N)		
Operational (LOS)	NI £		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x   x f_p)$	1763	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	pc/h/ln
S	59.5	mph	x f <sub>p</sub> )		ролипп
D = v <sub>p</sub> / S	29.6	pc/mi/ln	S		mph
LOS	D	ролини	$D = v_p / S$		pc/mi/ln
			Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed	E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens	ity	$E_{\rm T}$ - Exhibits 11-10, 11-11,		f <sub>IC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate		e-flow speed	f <sub>n</sub> - Page 11-18		TRD - Page 11-11
LOS - Level of service	BFFS - Ba	se free-flow	LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2	IND Tage 11-11
speed DDHV - Directional design	hour volume		11-3	· · <del>-</del> ,	
DDITY - Directional design	TIOUI VOIUITIE				

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>I-526 W</i>	/B
Agency or Company	Atkins		From/To	4135-Ci On	IFerry Off to CIFerry
Date Performed	7/25/2014		Jurisdiction	On	
Analysis Time Period	PM Peak		Analysis Year	2018 Bu Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Pla	nning Data
Flow Inputs					
Volume, V AADT	2936	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 12	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments				
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1)] 0.943	
Speed Inputs			Calc Speed Adj and		
Lane Width		ft	<u> </u>		
Rt-Side Lat. Clearance		ft	f <sub>LW</sub>		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph		60.0	
Base free-flow Speed,		•	FFS	60.0	mph
BFFS		mph			
LOS and Performanc	e Measures	6	Design (N)		
Operational (LOS)			Design (N)		
$v_p = (V \text{ or DDHV}) / (PHF x)$	Nyf		Design LOS		
$x f_p$	11 A 1HV 1729	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	$N \times f_{HV}$	pc/h/ln
S	59.7	mph	x f <sub>p</sub> )		ролин
D = v <sub>p</sub> / S	29.0	pc/mi/ln	S		mph
LOS	D	релипп	$D = v_p / S$		pc/mi/ln
			Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed	E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
V - Hourly volume	D - Dens	sity	$E_{\rm T}$ - Exhibits 11-10, 11-11,		f <sub>LC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate	FFS - Fre	e-flow speed	$f_{\rm p}$ - Page 11-18		TRD - Page 11-1
LOS - Level of service	BFFS - Ba	ase free-flow	LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2	IND - Fage 11-1
speed	hour volume		11-3	11-4,	
DDHV - Directional design	noui voiuine				

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# FREEWAY RAMP ADD OR DROP LANE ANALYSIS **ATKINS**

# **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description:

7/25/2014 2018 Build-River Center Site AM Peak Navy Base ICTF

Freeway/Direction Junction Segment ID

I-526 WB From Clements Ferry 4140

# Inputs

	Freeway Upstream of Ramp	Freeway Downstream of Ramp	Ramp
Number of Lanes, N	2	3	1
Free-Flow Speed, FFS (mph)	60	60	45
Volume, V (veh/h)	2,993	4,017	1,024
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, $P_T$	12%	12%	20%
%RVs, P <sub>R</sub>	0%	0%	0%

### Performance Measures

	Freeway Upstream Ramp	Freeway Downstream Ramp	Ramp
Heavy Vehicle Adjustment Factor, $f_{\rm HV}$	0.94	0.94	0.91
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	1,763	1,577	1,252
Capacity Flow Rate, c (pc/h/ln)	2,300	2,300	2,100
v/c ratio	0.77	0.69	0.60
Density, D <sub>MD</sub> (pc/mi/ln)	30.9	27.6	21.9
LOS	D	C	С

# Formulas and Reference Material

 $1 + P_T(E_T-1) + P_R(E_R-1)$ 

HCM 2010, Equation 11-3

 $PHF^*N^*f_{HV}^*f_P$ 

HCM 2010, Equation 11-2

 $D_{MD} =$ 

 $0.0175*v_{f}$ Ν

HCM 2010, Equation 13-26

**Basic Freeway Segments** Max Service Flow Rates

	Capacity
FFS (mi/h)	(pc/h/ln)
75	2,400
70	2,400
65	2,350
60	2,300
55	2,250

Source: HCM 2010, Exhibit 11-17

	Capacity
FFS (mi/h)	(pc/h/ln)
> 50	2,200
>40-50	2,100
>30-40	2,000
≥20-30	1,900
<20	1,800

Ramp Roadways Max

Service Flow Rates

Source: HCM 2010, Exhibit 13-10

Diverge LOS Thresholds

	Density
LOS	(pc/mi/ln)
Α	≤10
В	>10-20
С	>20-28
D	>28-35
E	>35
F	v/c > 1

Source: HCM 2010, Exhibit 13-2

# FREEWAY RAMP ADD OR DROP LANE ANALYSIS ATKINS

### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2018 Build-River Center Site PM Peak Navy Base ICTF Freeway/Direction Junction Segment ID

I-526 WB From Clements Ferry 4140

# Inputs

	Freeway Upstream of Ramp	Freeway Downstream of Ramp	Ramp
Number of Lanes, N	2	3	1
Free-Flow Speed, FFS (mph)	60	60	45
Volume, V (veh/h)	2,936	3,315	379
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	12%	12%	45%
%RVs, P <sub>R</sub>	0%	0%	0%

### Performance Measures

	Freeway Upstream Ramp	Freeway Downstream Ramp	Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.94	0.94	0.82
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	1,729	1,301	516
Capacity Flow Rate, c (pc/h/ln)	2,300	2,300	2,100
v/c ratio	0.75	0.57	0.25
Density, D <sub>MD</sub> (pc/mi/ln)	30.3	22.8	9.0
LOS	D	C	Α

# Formulas and Reference Material

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

٧ \_

HCM 2010, Equation 11-2

 $D_{MD} =$ 

0.0175\*v<sub>f</sub> N

HCM 2010, Equation 13-26

Basic Freeway Segments Max Service Flow Rates

	Capacity
FFS (mi/h)	(pc/h/ln)
75	2,400
70	2,400
65	2,350
60	2,300
55	2,250

Source: HCM 2010, Exhibit 11-17

Ramp Roadways Max Service Flow Rates

	Capacity
FFS (mi/h)	(pc/h/ln)
> 50	2,200
>40-50	2,100
>30-40	2,000
≥20-30	1,900
<20	1,800

Diverge LOS Thresholds

	Density
LOS	(pc/mi/ln)
Α	≤10
В	>10-20
С	>20-28
D	>28-35
Е	>35
F	v/c > 1

Source: HCM 2010, Exhibit 13-10

Source: HCM 2010, Exhibit 13-2

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	T	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>I-526 W</i>	/B
Agency or Company	Atkins		From/To		lementsFerry to
Date Performed	7/25/2014		Jurisdiction	Virginia	
Analysis Time Period	AM Peak		Analysis Year	2018 Bu Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	4017	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 12	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi	
Calculate Flow Adjus	tments		·		
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
ρ  E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$		
Speed Inputs	7.0		Calc Speed Adj and		
Lane Width		ft	Odic Opeca Auj ana		
Rt-Side Lat. Clearance		ft	f.		ma m la
Number of Lanes, N	2	ıt	f <sub>LW</sub>		mph
Total Ramp Density, TRD	-	ramps/mi	f <sub>LC</sub>		mph
FFS (measured)	60.0	mph	TRD Adjustment		mph
Base free-flow Speed,	00.0	·	FFS	60.0	mph
BFFS		mph			
LOS and Performanc	e Measures	3	Design (N)		
Operational (LOS)			Design (N)		
Operational (LOS)	Nyf		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x)$	11 A 1HV 2366	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	$N \times f_{HV}$	pc/h/ln
x f <sub>p</sub> ) S	49.3	mph	x f <sub>p</sub> )		рслілії
D = v <sub>p</sub> / S	49.3 47.9	pc/mi/ln	S		mph
LOS	47.9 F	рс/пп/п	$D = v_p / S$		pc/mi/ln
	,		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed	E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens	ity	$E_{\rm T}$ - Exhibits 11-10, 11-11,		f <sub>LC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate	FFS - Free	e-flow speed	$f_{\rm n}$ - Page 11-18		TRD - Page 11-11
LOS - Level of service	BFFS - Ba	ase free-flow	LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2	IND - Fage 11-11
speed DDHV - Directional design	hour volume		11-3	ı I- <b>∠</b> ,	

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed	AJR Atkins 7/25/2014		Highway/Direction of Trave From/To Jurisdiction	el I-526 W 4150-Cl Virginia	B ementsFerry to
Analysis Time Period	PM Peak		Analysis Year	2018 Bu Site	ıild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	☐ Plar	nning Data
Flow Inputs					
Volume, V AADT Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D	3315	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub> %RVs, P <sub>R</sub> General Terrain:	0.90 12 0 Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments				
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] 0.943	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f <sub>LW</sub>		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			,
LOS and Performanc	e Measures	<del></del>	Design (N)		
Operational (LOS) v <sub>p</sub> = (V or DDHV) / (PHF x l	N x f		Design (N) Design LOS		
x f <sub>p</sub> )	<sup>HV</sup> 1952 57.7	pc/h/ln mph	$v_p = (V \text{ or DDHV}) / (PHF x x f_p)$	N x f <sub>HV</sub>	pc/h/ln
D = v <sub>p</sub> / S	33.8	pc/mi/ln	S		mph
LOS	D	релили	D = V <sub>p</sub> / S	. NI	pc/mi/ln
Closesm			Required Number of Lanes	5, IN	
Glossary  N - Number of lanes	S - Spee	ed	Factor Location  E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens	ity	$E_{\rm T}$ - Exhibits 11-10, 11-12, $E_{\rm T}$ - Exhibits 11-10, 11-11,		$f_{LC}$ - Exhibit 11-9
v <sub>p</sub> - Flow rate LOS - Level of service speed	BFFS - Ba	e-flow speed ase free-flow	f <sub>p</sub> - Page 11-18 LOS, S, FFS, v <sub>p</sub> - Exhibits		TRD - Page 11-1
DDHV - Directional design	hour volume		11-3		

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Navy Base ICTF

			REEWA	<u> WEAV</u>	NG WOF	RKSHEE	<u>T</u>		
General	Information	on			Site Info	rmation			
Analyst AJR Agency/Company Atkins Date Performed 7/25/2014 Analysis Time Period AM Peak					Freeway/Dir Weaving Seg Analysis Yea	gment Location		WB - Virginia to F Build - River	
Project Desc <b>Inputs</b>	cription Navy Ba	ase ICTF							
Weaving con Weaving nun Weaving se Freeway free	mber of lanes, N gment length, L <sub>s</sub> e-flow speed, FF	S S		One-Sided 3 1415ft 60 mph	Segment typ Freeway min Freeway max Terrain type	imum speed			Freewa 1! 2300 Leve
Convers	sions to po	1	T .	l)	11		1 .	1	1
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	f <sub>HV</sub>	fp	v (pc/h)
$V_{FF}$	2977	0.90	14	0	1.5	1.2	0.935	1.00	3539
$V_{RF}$	104	0.90	68	0	1.5	1.2	0.746	1.00	155
$V_{FR}$	1040	0.90	14	0	1.5	1.2	0.935	1.00	1236
$V_RR$	36	0.90	68	0	1.5	1.2	0.746	1.00	54
$V_{NW}$	3593							V =	4984
$V_W$	1391								
VR	0.279								
	ration Cha		tics		1				
Minimum m	aneuver lanes, I	$N_{WL}$		2 lc	l .	_	hanges, LC <sub>MIN</sub>		1391 lc/h
Interchange	•			0.7 int/mi	Weaving lan		••		1570 lc/h
	F lane changes,	1.0		1 lc/pc	Non-weaving	g lane chang	es, LC <sub>NW</sub>		929 lc/h
	R lane changes,	110		1 lc/pc	Total lane ch	nanges, LC <sub>AL</sub>	L		2499 lc/h
Minimum RI	R lane changes,	LC <sub>RR</sub>		lc/pc	Non-weaving	g vehicle inde	ex, I <sub>NW</sub>		356
Weaving	g Segment	Speed,	Density,	Level of	li .				
	gment flow rate,			4984 pc/h		ensity factor,			0.354
Weaving segment capacity, c <sub>w</sub> 5602 veh/h Weaving segment speed, S  Weaving segment v/c ratio  0.831  Average weaving speed, S <sub>w</sub>					43.6 mph				
	gment v/c ratio	2	•	0.831	1		**		48.2 mph
Weaving se Level of Ser	gment density, [	J	3	8.1 pc/mi/ln E	Average non		1444		42.0 mph
	VIOG, LOO				Maximum we	eaving lengtr	I, L <sub>MAX</sub>		5361 ft
Chapter 13, "	egments longer the Freeway Merge a es that exceed the	and Diverge Se	egments".	Ü		solated merge	and diverge ar	eas using the	procedures of

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Navy Base ICTF

			REEWA	<u>r weav</u>	NG WOR	KKSHEE	<u> </u>		
General	Information	on			Site Info	rmation			
Analyst Agency/Con Date Perforr Analysis Tim	med	AJR Atkins 7/25/20 PM Pe			Freeway/Dir Weaving Seg Analysis Yea	gment Location		WB - Virginia to F Build - River	
Project Desc <b>Inputs</b>	cription Navy Ba	ase ICTF							
Weaving con Weaving nun Weaving se Freeway free	mber of lanes, N gment length, L <sub>s</sub> e-flow speed, FF	S S		One-Sided 3 1415ft 60 mph	Segment typ Freeway min Freeway max Terrain type	imum speed,			Freewa 1: 230 Leve
Convers	sions to po	1	T .	l)	11	· -	1 .	1 .	1
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	f <sub>HV</sub>	fp	v (pc/h)
V <sub>FF</sub>	2315	0.90	13	0	1.5	1.2	0.939	1.00	2739
$V_{RF}$	579	0.90	13	0	1.5	1.2	0.939	1.00	685
V <sub>FR</sub>	1000	0.90	13	0	1.5	1.2	0.939	1.00	1183
$V_{RR}$	251	0.90	10	0	1.5	1.2	0.952	1.00	293
$V_{NW}$	3032							V =	4900
V <sub>W</sub>	1868								
VR	0.381								
	ration Cha		tics		Minimum	anina lana al	hanna I C		4000 1- //-
	aneuver lanes, I	N <sub>WL</sub>		2 lc	l .	_	hanges, LC <sub>MIN</sub>		1868 lc/h
Interchange	•	1.0		0.7 int/mi	Weaving lan		••		2047 lc/h
	F lane changes,	141		1 lc/pc	Non-weaving				814 lc/h
	R lane changes,	110			Total lane ch	- /12	-		2861 lc/h
	R lane changes,	100	- 1		Non-weaving				300
`	g Segment		Density,		li .	-			0.204
•	gment flow rate,			4900 pc/h		ensity factor,			0.394 41.6 mph
Weaving segment capacity, c <sub>w</sub> 5389 veh/h Weaving segment speed, S Average weaving speed, S <sub>w</sub>						47.3 mph			
J	egment v/c ratio egment density, I	D	3	0.854 9.3 pc/mi/ln	Average non		**		38.7 mph
Level of Ser	•		3	9.3 pc/m/m	Maximum we		1444		6471 f
Notes	,				Maximum W		·· · -MAX		077111
a. Weaving so	egments longer the Freeway Merge a es that exceed the	and Diverge Se	egments".	Ü		solated merge	and diverge ar	eas using the	procedures of

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed	AJR Atkins 7/25/2014		Highway/Direction of Trave From/To Jurisdiction	4165-RI	/B hett Off to Rhett On uild - River Center
Analysis Time Period	AM Peak		Analysis Year	Site	and - Miver Gerner
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	3081	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 15	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1)] 0.930	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performanc	e Measures	<u> </u>	Design (N)		
Operational (LOS) v <sub>p</sub> = (V or DDHV) / (PHF x	N x f <sub>HV</sub> 1840	pc/h/ln	Design (N) Design LOS v <sub>p</sub> = (V or DDHV) / (PHF x	N x f <sub>HV</sub>	no/h/ln
x f <sub>p</sub> ) S	59.0	mph	x f <sub>p</sub> )		pc/h/ln
D = v <sub>p</sub> / S	31.2	pc/mi/ln	S		mph
LOS	D	ролили	$D = v_p / S$ Required Number of Lane	s. N	pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume	S - Spee	sity	E <sub>R</sub> - Exhibits 11-10, 11-12 E <sub>T</sub> - Exhibits 11-10, 11-11		f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate LOS - Level of service speed DDHV - Directional design	BFFS - Ba	e-flow speed ase free-flow	f <sub>p</sub> - Page 11-18 LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3		TRD - Page 11-11
Diriv - Directional design	TIOUI VOIUITIE				

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed	AJR Atkins 7/25/2014		Highway/Direction of Trave From/To Jurisdiction	4165-RI	/B hett Off to Rhett On uild - River Center
Analysis Time Period	PM Peak		Analysis Year	Site	ilia - River Ceriler
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	2894	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 14	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1)] 0.935	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			r-
LOS and Performanc	e Measures	5	Design (N)		
Operational (LOS)  V <sub>p</sub> = (V or DDHV) / (PHF x I	N x f <sub>HV</sub> 1720	pc/h/ln	Design (N) Design LOS v <sub>p</sub> = (V or DDHV) / (PHF x	N x f <sub>HV</sub>	no/h/ln
x f <sub>p</sub> ) S	59.7	mnh	x f <sub>p</sub> )		pc/h/ln
D = v <sub>p</sub> / S	28.8	mph pc/mi/ln	S		mph
LOS	D	рслили	$D = v_p / S$	- NI	pc/mi/ln
			Required Number of Lane	S, IN	
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed	BFFS - Ba		$E_R$ - Exhibits 11-10, 11-12 $E_T$ - Exhibits 11-10, 11-11, $f_p$ - Page 11-18 LOS, S, FFS, $v_p$ - Exhibits	, 11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-11
DDHV - Directional design	hour volume		11-3		

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	RAI	MPS AND	RAMP JUNG	CTIONS W	ORKSHI	EET			
General Infori	mation			Site Infor	mation				
Analyst	AJR		Fre	eeway/Dir of Tra	avel I-526 WB				
Agency or Company	Atkin	S	Jui	nction		4170-WB On f	rom Rhett		
Date Performed	7/25/			risdiction					
Analysis Time Period			An	alysis Year		2018 Build - R	iver Center Site		
Project Description	Navy Base ICT	†							
Inputs		Erooway Num	shor of Lanca N					1	
Upstream Adj Ramp		1 '	ber of Lanes, N	2				Downstre	am Adj
☐Yes ☐On		Ramp Numbe		1				Ramp	
		1	ane Length, L <sub>A</sub>	625				Yes	On
☑ No ☐ Off		1	Lane Length L <sub>D</sub>	2004				✓ No	Off
L <sub>up</sub> = ft		Freeway Volu		3081				L <sub>down</sub> =	ft
L <sub>up</sub> = ft		Ramp Volume	11	719				down	
$V_u = veh/h$		1	-Flow Speed, S <sub>FF</sub>	60.0				$V_D =$	veh/h
			low Speed, S <sub>FR</sub>	45.0					
Conversion to		der Base	Conditions		1	1		<del>                                     </del>	
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	f <sub>p</sub>	v = V/PHI	$F x f_{HV} x f_{p}$
Freeway	3081	0.90	Level	15	0	0.930	1.00	1 :	3680
Ramp	719	0.90	Level	7	0	0.966	1.00		827
UpStream									
DownStream									
Estimation of		Merge Areas			Ectimot	ion of v	Diverge Areas		
Estimation of					ESuman	ion of v <sub>12</sub>			
	$V_{12} = V_{F}$					V <sub>12</sub>	$= V_R + (V_F - V_F)$	<sub>R</sub> )P <sub>FD</sub>	
L <sub>EQ</sub> =	(Equa	ation 13-6 o	r 13-7)		L <sub>EQ</sub> = (Equation 13-12 or 13-13)				
P <sub>FM</sub> =	1.000	using Equa	tion (Exhibit 13-6)		P <sub>FD</sub> =		using Equati	on (Exhibit 1	3-7)
V <sub>12</sub> =	3680	pc/h			V <sub>12</sub> = pc/h				
V <sub>3</sub> or V <sub>av34</sub>	0 pc/h	n (Equation	13-14 or 13-17)		$V_3$ or $V_{av34}$		pc/h (Equation	13-14 or 13-	17)
Is V <sub>3</sub> or V <sub>av34</sub> > 2,700	pc/h? Yes	s 🗹 No			Is V <sub>3</sub> or V <sub>av3</sub>	<sub>34</sub> > 2,700 pc/h	? Yes No	)	
Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 *	V <sub>12</sub> /2	s 🗹 No			Is V <sub>3</sub> or V <sub>av3</sub>	<sub>34</sub> > 1.5 * V <sub>12</sub> /2	Yes No		
If Yes,V <sub>12a</sub> =			3-16, 13-18, or		If Yes,V <sub>12a</sub> =		pc/h (Equation	on 13-16, 1	3-18, or
Capacity Che	13-19)						13-19)		
Capacity Cire		T c	`anaoity	100 E2	Capacity	y Checks	ual C	anaoity.	100 52
	Actual		Capacity	LOS F?	V <sub>F</sub>	Actu	Exhibit 13	apacity	LOS F?
					<u> </u>	1/	Exhibit 13	_	
V <sub>FO</sub>	4507	Exhibit 13-8		No	$V_{FO} = V_{F}$	- v <sub>R</sub>			
					$V_R$		Exhibit 1:	3-	
Flow Entering	Merge In	fluence A	\rea		Flow En	tering Div	verge Influe	nce Area	<u></u>
Ĭ	Actual		Desirable	Violation?		Actual	Max De		Violation?
V <sub>R12</sub>	4507	Exhibit 13-8	4600:AII	No	V <sub>12</sub>		Exhibit 13-8		
Level of Servi	ce Detern	nination (	if not F)		Level of	Service I	Determination	on (if not	<i>F</i> )
D <sub>R</sub> = 5.475 + 1	0.00734 v <sub>R</sub> + 0	0.0078 V <sub>12</sub> - 0.	00627 L <sub>A</sub>		ī	O <sub>R</sub> = 4.252 -	+ 0.0086 V <sub>12</sub> - 0	0.009 L <sub>D</sub>	,
D <sub>R</sub> = 36.3 (pc/mi	/ln)				$D_R = (p$	c/mi/ln)			
LOS = E (Exhibit 1	3-2)					xhibit 13-2)			
Speed Determ					<u> </u>	etermina	tion		
$M_S = 0.618$ (Exib					<del>'</del>	xhibit 13-12)			
						ph (Exhibit 13-	12)		
	Exhibit 13-11)					oh (Exhibit 13-	•		
	Exhibit 13-11) Exhibit 13-13)				ľ	oh (Exhibit 13-	•		
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	RAI	MPS AND	RAMP JUNG	CTIONS W	ORKSHE	ET			
General Infor	mation			Site Infor	mation				
Analyst	AJR		Fre	eeway/Dir of Tr	avel I-526 WB				
Agency or Company	Atkin	S	Jui	nction		4170-WB On fro	m Rhett		
Date Performed	7/25/			risdiction					
Analysis Time Period			An	alysis Year		2018 Build - Riv	er Center Site		
Project Description	Navy Base IC I	ŀ							
Inputs		lN	Januar II anna a Ni					ì	
Upstream Adj Ramp		1 '	nber of Lanes, N	2				Downstre	am Adj
☐Yes ☐On	1	Ramp Numbe		1				Ramp	
	•	1	ane Length, L <sub>A</sub>	625				□Yes	On
☑ No ☐ Off	f	Freeway Volu	Lane Length L <sub>D</sub>	2894				✓ No	Off
L <sub>up</sub> = ft		Ramp Volume		589				L <sub>down</sub> =	ft
up		1	Flow Speed, S <sub>FF</sub>	60.0					
$V_u = veh/h$	l	1	low Speed, S <sub>FR</sub>	45.0				V <sub>D</sub> =	veh/h
Conversion to	o nc/h Un/								
	<del>βεπιοπο</del>   γ				1	1 ,			
(pc/h)	(Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	f <sub>p</sub>	v = V/PHI	x f <sub>HV</sub> x f <sub>p</sub>
Freeway	2894	0.90	Level	14	0	0.935	1.00		3441
Ramp	589	0.90	Level	7	0	0.966	1.00		677
UpStream		$\vdash$							
DownStream		<u>                                     </u>					Diverge Areas		
Estimation of		WEIGE AIEas			Fstimati	on of v <sub>12</sub>	Diverge Areas		
		(D)					N . 01 N	,5	
	$V_{12} = V_F$					V <sub>12</sub> =	= V <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>		
L <sub>EQ</sub> =		ation 13-6 o			L <sub>EQ</sub> = (Equation 13-12 or 13-13)				
P <sub>FM</sub> =			tion (Exhibit 13-6)		P <sub>FD</sub> =		using Equation	on (Exhibit 1	3-7)
V <sub>12</sub> =	3441				V <sub>12</sub> = pc/h				
V <sub>3</sub> or V <sub>av34</sub>			13-14 or 13-17)		$V_3$ or $V_{av34}$		pc/h (Equation		.7)
Is V <sub>3</sub> or V <sub>av34</sub> > 2,70							☐ Yes ☐ No		
Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 *					Is V <sub>3</sub> or V <sub>av3</sub>	<sub>34</sub> > 1.5 * V <sub>12</sub> /2	☐Yes ☐ No		
If Yes,V <sub>12a</sub> =	pc/h 13-19)		3-16, 13-18, or		If Yes,V <sub>12a</sub> =		pc/h (Equation 13-19)	n 13-16, 1	3-18, or
Capacity Che					Canacity	/ Checks	13-19)		
	Actual		Capacity	LOS F?	Cupacity	Actua	ıl Ca	pacity	LOS F?
			- ор аголу		V <sub>F</sub>		Exhibit 13-	<del>' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' </del>	
	4440	E 131340 0		N.	$V_{FO} = V_{F}$	- V_	Exhibit 13-		+
V <sub>FO</sub>	4118	Exhibit 13-8		No		· R	Exhibit 13		+
					V <sub>R</sub>		10		
Flow Entering	g Merge In	fluence A	\rea		Flow En	tering Div	erge Influer	nce Area	
	Actual	Max	Desirable	Violation?		Actual	Max Des	sirable	Violation?
V <sub>R12</sub>	4118	Exhibit 13-8	4600:AII	No	V <sub>12</sub>		Exhibit 13-8		
Level of Serv							eterminatio		<i>F</i> )
D <sub>R</sub> = 5.475 +	$0.00734  \mathrm{v}_{R} + 0$	0.0078 V <sub>12</sub> - 0.	00627 L <sub>A</sub>			$O_R = 4.252 +$	0.0086 V <sub>12</sub> - 0	0.009 L <sub>D</sub>	
$D_{R} = 33.4 \text{ (pc/m}$	ii/ln)				$D_R = (p$	c/mi/ln)			
LOS = D (Exhibit	13-2)				LOS = (E	xhibit 13-2)			
Speed Detern	nination				Speed D	eterminat	ion		
M <sub>S</sub> = 0.504 (Exil	bit 13-11)				$D_s = (E$	xhibit 13-12)			
1	(Exhibit 13-11)					oh (Exhibit 13-12	2)		
	Exhibit 13-11)					oh (Exhibit 13-12	•		
S = 50.9  mph (	(Exhibit 13-11)				ľ	oh (Exhibit 13-1	-		
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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed	AJR Atkins 7/25/2014		Highway/Direction of Trave From/To Jurisdiction	4180-RI	/B hett to Rivers uild - River Center
Analysis Time Period	AM Peak		Analysis Year	Site	and ravor corner
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			es.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	3800	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 15	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1)] 0.930	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	55.0	mph	FFS	55.0	mph
Base free-flow Speed, BFFS		mph			·
LOS and Performanc	e Measures	}	Design (N)		
Operational (LOS) v <sub>p</sub> = (V or DDHV) / (PHF x I	N x f <sub>HV</sub> 2269	pc/h/ln	Design (N) Design LOS v <sub>p</sub> = (V or DDHV) / (PHF x	N x f <sub>HV</sub>	
x f <sub>p</sub> )	40.0	•	$x f_p$	111	pc/h/ln
S D = v / S	49.6 45.8	mph	s		mph
D = v <sub>p</sub> / S LOS	45.8 F	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LO3			Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed DDHV - Directional design	BFFS - Ba		E <sub>R</sub> - Exhibits 11-10, 11-12 E <sub>T</sub> - Exhibits 11-10, 11-11, f <sub>p</sub> - Page 11-18 LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-11

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed	AJR Atkins 7/25/2014		Highway/Direction of Trave From/To Jurisdiction	4180-Ri	/B hett to Rivers uild - River Center
Analysis Time Period	PM Peak		Analysis Year	Site	and - Miver Gerner
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			es.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	3483	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 14	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi	
Calculate Flow Adjus	tments				
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1)] 0.935	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f <sub>LW</sub>		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	55.0	mph	FFS	55.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performanc	e Measures	3	Design (N)		
Operational (LOS) v <sub>p</sub> = (V or DDHV) / (PHF x l	N x f <sub>HV</sub> 2070	pc/h/ln	Design (N) Design LOS v <sub>p</sub> = (V or DDHV) / (PHF x	N x f <sub>uv</sub>	
x f <sub>p</sub> )		·	x f <sub>p</sub> )	п۷	pc/h/ln
S - v / S	53.2	mph	s		mph
D = v <sub>p</sub> / S	38.9	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	E		Required Number of Lane	s, N	
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed DDHV - Directional design	BFFS - Ba		E <sub>R</sub> - Exhibits 11-10, 11-12 E <sub>T</sub> - Exhibits 11-10, 11-11 f <sub>p</sub> - Page 11-18 LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	, 11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1

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General In	formation	1.0.1111	S AND RAM	Site Infor								
Analyst	AJR	)	Е.	reeway/Dir of Tr		1 506 14	/D					
analysi Agency or Comp				unction		I-526 WB 4190-WB Off to Rivers NB						
ate Performed	•	5/2014		urisdiction		4130-11	ID OII to IV	IVEIS IND				
nalysis Time P		Peak		nalysis Year		2018 B	uild - River	Center Site				
	ion Navy Base IC		7.0	naryolo roar		2010 B	ulia Ttivol	CONTON CITO				
nputs	,											
Upstream A	ıdi Ramn	Freeway Num	ber of Lanes, N	2					Downstre	am Adi		
_	_	Ramp Number	of Lanes, N	1					Ramp	amraj		
□Yes	□ On	Acceleration L	ane Length, L <sub>A</sub>						□Yes	On		
✓ No	Off	Deceleration L	ane Length L <sub>D</sub>	725					✓No	Off		
_	_	Freeway Volui	me, V <sub>F</sub>	3800								
L <sub>up</sub> =	ft	Ramp Volume	, V <sub>R</sub>	233					L <sub>down</sub> =	ft		
\/ -	vah/h	Freeway Free	-Flow Speed, $S_{\rm FF}$	55.0					V <sub>D</sub> =	veh/h		
$V_u =$	veh/h	Ramp Free-Flo	ow Speed, S <sub>FR</sub>	45.0					l D	VCII/II		
conversio	n to pc/h Un	der Base (	Conditions									
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	fp	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>		
reeway	3800	0.90	Level	15	0	-	930	1.00		539		
Ramp	233	0.90	Level	2	0	_	990	1.00		261		
JpStream		1 111		_								
DownStream												
		Merge Areas						Diverge Areas				
stimation	of v <sub>12</sub>				Estimat	ion o	f v <sub>12</sub>					
	V <sub>12</sub> = V <sub>1</sub>	<sub>F</sub> (P <sub>FM</sub> )					V <sub>12</sub> =	· V <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>	R)P <sub>ED</sub>			
EQ =	(Equ	ation 13-6 or	13-7)		L <sub>EQ</sub> =			Equation 13-1	–	3)		
FM =		g Equation (E			P <sub>FD</sub> =			000 using Equ				
12 =	pc/h		,		V <sub>12</sub> =			539 pc/h		,		
or V <sub>av34</sub>	•	(Equation 13-	.14 or 13 <sub>-</sub> 17)		V <sub>3</sub> or V <sub>av34</sub>			pc/h (Equatio	n 13 <sub>-</sub> 14 o	r 13_17)		
	2,700 pc/h? ☐ Y€		14 01 10 17)			> 2.7		Yes ☑ No	/// 13-1 <del>4</del> 0	1 13-17)		
	1.5 * V <sub>12</sub> /2  \( \text{Y} \)							Yes ✓ No				
0 0,01			-16, 13-18, or					_ res ⊻ No c/h (Equation	13_16 13	L-18 or 13		
Yes,V <sub>12a</sub> =	13-19		10, 13-10, 01		If Yes,V <sub>12a</sub> =	=		9)	10-10, 10	7-10, 01-13		
Capacity C	Checks	,			Capacit	y Che	ecks	,				
	Actual	С	apacity	LOS F?			Actual	Ca	pacity	LOS F		
					V <sub>F</sub>		4539	Exhibit 13-8	4500	Yes		
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$	- V <sub>R</sub>	4278	Exhibit 13-8	4500	No		
					V <sub>R</sub>	- 1	261	Exhibit 13-1	0 2100	No		
low Ento	ring Merge II	nfluonco A	ro2			torin		rge Influen		1		
TOW LINE	Actual		Desirable	Violation?	I TOW LI	_	Actual	Max Desirab		Violation		
V <sub>R12</sub>	7101001	Exhibit 13-8	300114310	Violation:	V <sub>12</sub>	$\overline{}$	539	Exhibit 13-8	4400:All	Yes		
	ervice Deter		f not E)					terminatio				
									<u> </u>	<i>r)</i>		
	+ 0.00734 v <sub>R</sub> +	· 0.0076 V <sub>12</sub> -	0.00627 L <sub>A</sub>		1			.0086 V <sub>12</sub> - 0.	009 L <sub>D</sub>			
$_{R}$ = (pc/m					l ''	6.8 (pc/	,					
	ibit 13-2)					`	oit 13-2)					
Speed Det	ermination				Speed E							
4 - 4 <del>-</del> 1	oit 13-11)				1 1	321 (E	xhibit 13-	-12)				
$I_S = (Exib)$	3					S <sub>R</sub> = 50.8 mph (Exhibit 13-12)						
	S <sub>R</sub> = mph (Exhibit 13-11)											
R= mph (	Exhibit 13-11)				1	/A mph	(Exhibit	13-12)				
$_{\rm R}^{\rm =}$ mph ( $_{\rm 0}^{\rm =}$ mph (	· · · · · · · · · · · · · · · · · · ·				$S_0 = N$		(Exhibit (Exhibit	•				

F-4049

		RAMP	S AND RAI	//P JUNCTI	ONS WO	RKS	HEET			
General Infor	mation		- / IVAII	Site Infor						
Analyst	AJR		F	reeway/Dir of Tr		I-526 V	VB			
Agency or Company	gency or Company Atkins Ju					4190-WB Off to Rivers NB				
Date Performed	rformed 7/25/2014 Jurisdiction									
Analysis Time Period			<i>F</i>	Analysis Year		2018 B	uild - River	Center Site		
Project Description	Navy Base ICT	F								
Inputs		l							1	
Upstream Adj R	amp	Freeway Num Ramp Numbe	ber of Lanes, N	2 1					Downstrea Ramp	am Adj
□Yes □	On	l '	ane Length, L <sub>A</sub>	,					Yes	On
✓ No	Off	1	Lane Length L <sub>D</sub>	725					☑ No	Off
L <sub>up</sub> = fl	:	Freeway Volu Ramp Volume		3483 163					L <sub>down</sub> =	ft
ир		l	·, • <sub>R</sub> -Flow Speed, S <sub>ee</sub>							
V <sub>u</sub> = ve	eh/h		low Speed, S <sub>FR</sub>	45.0					V <sub>D</sub> =	veh/h
Conversion to		<u> </u>	111							
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	fp	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>
Freeway	3483	0.90	Level	14	0	0.	935	1.00	41	41
Ramp	163	0.90	Level	2	0	_	990	1.00	1	83
UpStream										
DownStream										
<b>-</b>		Merge Areas			<b>F</b> - 4i 4		<u> </u>	Diverge Areas		
Estimation of	V <sub>12</sub>				Estimat	ion o				
	$V_{12} = V_{F}$	(P <sub>FM</sub> )					V <sub>12</sub> =	V <sub>R</sub> + (V <sub>F</sub> - V	<sub>R</sub> )P <sub>FD</sub>	
L <sub>EQ</sub> =	(Equa	tion 13-6 or	13-7)		L <sub>EQ</sub> =		(	Equation 13-	12 or 13-13	5)
P <sub>FM</sub> =	using	Equation (	Exhibit 13-6)		P <sub>FD</sub> =		1.	000 using Eq	uation (Exhi	ibit 13-7)
V <sub>12</sub> =	pc/h				V <sub>12</sub> =		41	141 pc/h		
V <sub>3</sub> or V <sub>av34</sub>	pc/h (l	Equation 13	-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>		0	pc/h (Equati	on 13-14 o	r 13-17)
Is V <sub>3</sub> or V <sub>av34</sub> > 2,70	0 pc/h? ☐ Yes	s 🗌 No				, <sub>34</sub> > 2,7		∃Yes ☑ No		
Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 *								∃Yes ☑ No		
If Yes,V <sub>12a</sub> =		Equation 13	-16, 13-18, or		If Yes,V <sub>12a</sub>			c/h (Equation	n 13-16, 13	-18, or 13-
Capacity Che					Capacit	ty Ch		- /		
	Actual		apacity	LOS F?			Actual	C	apacity	LOS F?
					V <sub>F</sub>		4141	Exhibit 13-	8 4500	No
$V_{FO}$		Exhibit 13-8			V <sub>FO</sub> = V <sub>F</sub>	- V <sub>D</sub>	3958	Exhibit 13-	8 4500	No
10					V <sub>R</sub>		183	Exhibit 13-		No
Flow Entering	Merae In	fluence A	rea		Flow Er	nterin	a Dive	rge Influer	ice Area	
	Actual		Desirable	Violation?		_	Actual	Max Desira		Violation?
V <sub>R12</sub>		Exhibit 13-8			V <sub>12</sub>	4	1141	Exhibit 13-8	4400:All	No
Level of Serv	ice Detern	nination (	if not F)	•	Level o	f Serv	vice De	terminatio	n (if not	F)
$D_R = 5.475 + 0.$	00734 v <sub>R</sub> + 0	0.0078 V <sub>12</sub> -	- 0.00627 L <sub>A</sub>			D <sub>R</sub> = 4	1.252 + 0	.0086 V <sub>12</sub> - 0	.009 L <sub>D</sub>	
D <sub>R</sub> = (pc/mi/ln	)				D <sub>R</sub> = 3	3.3 (pc.	/mi/ln)			
LOS = (Exhibit '	13-2)					(Exhil	oit 13-2)			
Speed Detern	nination				Speed I	`		on		
					<del>- '</del>		xhibit 13-			
$M_S = (Exibit 13)$	*				1	-	(Exhibit			
	ibit 13-11)				1	-	(Exhibit	•		
	ibit 13-11) ibit 13-13)				1	-	•	•		
ļ		III Diabta Dar	und				(Exhibit		norotod: 40/0/	2014 40:40 41
Copyright © 2012 Unive	risity of Fiorida, A	ııı kıgnts Keser	vea		HCS2010 <sup>™</sup>	Version	6.41	Ge	nerated: 12/9/	2014 10:10 Al

General In	formation			IP JUNCTI Site Infor		10						
Analyst	AJR	1	г.	reeway/Dir of Tr		I-526 W	/R					
Agency or Comp				unction			иь ИВ Off to R	ivers SB				
ate Performed	-	5/2014		urisdiction		<del>1</del> 200-11	ID OII to IX	IVEI3 OD				
nalysis Time Pe		Peak		nalysis Year		2018 B	uild - River	Center Site				
	on Navy Base IC		7.0	naryoro roar		2010 B	ana ravoi	CONTON CITO				
nputs												
Upstream A	di Ramo	Freeway Num	per of Lanes, N	2					Downstre	am Adi		
·	_	Ramp Number	of Lanes, N	1					Ramp	amraj		
□Yes	□ On	Acceleration L	ane Length, L <sub>A</sub>						□Yes	On		
✓ No	Off	Deceleration L	ane Length L <sub>D</sub>	700					✓ No	Off		
<del></del>	_	Freeway Volur	ne, V <sub>F</sub>	3567								
L <sub>up</sub> =	ft	Ramp Volume	11	215					L <sub>down</sub> =	ft		
V,, =	veh/h	Freeway Free-	Flow Speed, $S_{FF}$	55.0					V <sub>D</sub> =	veh/h		
v <sub>u</sub> –	venin	Ramp Free-Flo	ow Speed, S <sub>FR</sub>	25.0					- Д			
onversio	n to pc/h Un	der Base (	Conditions									
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	fp	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>		
reeway	3567	0.90	Level	17	0	0.9	922	1.00	4	300		
Ramp	215	0.90	Level	6	0	0.9	971	1.00	2	246		
JpStream												
OownStream												
- 47 47		Merge Areas			<b>5</b> (1) (			Diverge Areas				
stimation	of V <sub>12</sub>				Estimat	ion o	t v <sub>12</sub>					
	$V_{12} = V_{F}$	(P <sub>FM</sub> )					V <sub>12</sub> =	V <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>	R)P <sub>FD</sub>			
EQ =	(Equ	ation 13-6 or	13-7)		L <sub>EQ</sub> =		(1	Equation 13-1	2 or 13-13	3)		
= FM =	using	g Equation (E	xhibit 13-6)		P <sub>FD</sub> =		1.	000 using Equ	uation (Exh	nibit 13-7)		
12 =	pc/h				V <sub>12</sub> =			300 pc/h	,	,		
or V <sub>av34</sub>	•	(Equation 13-	14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>			pc/h (Equation	n 13-14 o	r 13-17)		
	2,700 pc/h? ☐ Y€		,			>27		Yes ☑ No		,		
	1.5 * V <sub>12</sub> /2							Yes ☑ No				
0 0,01			-16, 13-18, or					c/h (Equation	13-16 13	8-18 or 13		
Yes,V <sub>12a</sub> =	13-19	: .	10, 10 10, 01		If Yes,V <sub>12a</sub> =	•		9)	10 10, 10	7 10, 01 10		
Capacity C	hecks				Capacit	y Che	ecks					
	Actual	C	apacity	LOS F?			Actual	Ca	pacity	LOS F		
					$V_{F}$		4300	Exhibit 13-8	4500	No		
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$	- V <sub>R</sub>	4054	Exhibit 13-8	4500	No		
. 0					V <sub>R</sub>		246	Exhibit 13-1	1900	No		
low Enter	ring Merge li	nfluence A	rea			terin	a Dive	rge Influen	ce Area			
1011 211101	Actual		Desirable	Violation?	1 1011 211	_	Actual	Max Desirab		Violation		
V <sub>R12</sub>		Exhibit 13-8			V <sub>12</sub>	$\overline{}$	1300	Exhibit 13-8	4400:All	No		
	ervice Deter		f not F)	<u> </u>				termination				
	+ 0.00734 v <sub>R</sub> +							.0086 V <sub>12</sub> - 0.0	_	')		
		0.0070 V <sub>12</sub>	0.00027 L <sub>A</sub>					.0000 v <sub>12</sub> - 0.	003 LD			
$_{R}$ = (pc/m					I	1.9 (pc/	,					
	bit 13-2)					`	oit 13-2)					
peed Det	ermination				Speed L							
l <sub>S</sub> = (Exib	it 13-11)				1 *	580 (E	xhibit 13-	-12)				
3 (					$S_R = 47$	7.5 mph	(Exhibit	13-12)				
<sub>R</sub> = mph (I	S <sub>R</sub> = mph (Exhibit 13-11)											
	Exhibit 13-11)				$S_0 = N$	/A mph	(Exhibit	13-12)				
<sub>0</sub> = mph (I						-	(Exhibit (Exhibit)					

General In	formation	13/31111	S AND RAM	Site Infor								
Analyst	AJR	)	Е.	reeway/Dir of Tr		I-526 W	/D					
Agency or Comp				unction			'Б /B Off to R	ivers SB				
ate Performed	-	5/2014		urisdiction		4200-11	Oli to ix	IVEIS OD				
nalysis Time P		Peak		nalysis Year		2018 Bi	uild - River	Center Site				
	ion Navy Base IC		7 1	naryolo roar		2010 0	ulia Ttivoi	Contor Cito				
nputs	<u> </u>											
Upstream A	Adi Ramp	Freeway Num	ber of Lanes, N	2					Downstre	am Adi		
· _	_	Ramp Number	of Lanes, N	1					Ramp			
□Yes	☐ On	Acceleration L	ane Length, L <sub>A</sub>						□Yes	On		
✓ No	Off	Deceleration L	ane Length L <sub>D</sub>	700					✓ No	Off		
_	_	Freeway Volui	me, V <sub>F</sub>	3320								
L <sub>up</sub> =	ft	Ramp Volume	, V <sub>R</sub>	64					L <sub>down</sub> =	ft		
\/ -	vah/h	Freeway Free	Flow Speed, $S_{FF}$	55.0					V <sub>D</sub> =	veh/h		
$V_u =$	veh/h	Ramp Free-Flo	ow Speed, S <sub>FR</sub>	25.0					• D	VO11/11		
Conversio	n to pc/h Un	der Base (	Conditions									
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	fp	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>		
reeway	3320	0.90	Level	15	0	0.9	930	1.00		966		
Ramp	64	0.90	Level	17	0	_	922	1.00		77		
JpStream		1				+ **						
DownStream												
		Merge Areas				_		iverge Areas				
stimation	of v <sub>12</sub>				Estimat	ion o	f v <sub>12</sub>					
	V <sub>12</sub> = V <sub>F</sub>	F(P <sub>FM</sub> )					V <sub>12</sub> =	V <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>	P <sub>ED</sub>			
EQ =	(Equ	ation 13-6 or	13-7)		L <sub>EQ</sub> =			Equation 13-1	–	3)		
= FM =		g Equation (E			P <sub>FD</sub> =			000 using Equ				
12 =	pc/h		,		V <sub>12</sub> =			966 pc/h	(=:::	,		
' <sub>3</sub> or V <sub>av34</sub>	•	(Equation 13-	-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>			pc/h (Equatio	n 13-14 o	r 13_17)		
	2,700 pc/h? ☐ Y€		110110111			>27		Yes ☑ No	11 10 11 0	1 10 17)		
	1.5 * V <sub>12</sub> /2							Yes ☑ No				
			-16, 13-18, or					c/h (Equation	13_16 13	-18 or 13		
Yes,V <sub>12a</sub> =	13-19	· ·	10, 10-10, 01		If Yes,V <sub>12a</sub> =	•	19		10-10, 10	-10, 01 13		
Capacity C	Checks				Capacit	y Che	ecks					
	Actual	C	apacity	LOS F?			Actual	Ca	pacity	LOS F		
					$V_{F}$		3966	Exhibit 13-8	4500	No		
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$	- V <sub>R</sub>	3889	Exhibit 13-8	4500	No		
					V <sub>R</sub>	- 1	77	Exhibit 13-1	1900	No		
low Ento	ring Merge II	nfluonco A	ro2			torin		rge Influen		1		
TOW LINE	Actual		Desirable	Violation?	I TOW LI	_	Actual	Max Desirab		Violation		
V <sub>R12</sub>	7101001	Exhibit 13-8		VIOLATION:	V <sub>12</sub>	_	966	Exhibit 13-8	4400:All	No		
	ervice Deteri		f not E)					terminatio				
									_ `	Γ)		
	+ 0.00734 v <sub>R</sub> +	0.0076 V <sub>12</sub> -	0.00627 L <sub>A</sub>					.0086 V <sub>12</sub> - 0.0	009 L <sub>D</sub>			
$_{R}$ = (pc/m					I	2.1 (pc/	,					
	ibit 13-2)					`	oit 13-2)					
Speed Det	ermination				Speed E							
1 <sub>S</sub> = (Exib	oit 13-11)				1	565 (E	xhibit 13-	12)				
3 (						7.7 mph	(Exhibit	13-12)				
	N											
R= mph (	Exhibit 13-11)				$S_0 = N_0$	/A mph	(Exhibit	13-12)				
$_{\rm R}^{\rm =}$ mph ( $_{\rm 0}^{\rm =}$ mph (	•					-	(Exhibit ) (Exhibit	*				

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed Analysis Time Period	AJR Atkins 7/25/2014 AM Peak		Highway/Direction of Trave From/To Jurisdiction Analysis Year	4205-R. Rivers ( 2018 B	iversSB Off to
Project Description Navy	Base ICTF			Site	
✓ Oper.(LOS)			Des.(N)	Pla	nning Data
Flow Inputs			. ,		
Volume, V AADT Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D	3352	veh/h veh/day veh/h	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub> %RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0.90 17 0 Level mi	
Calculate Flow Adjus	tments		<u> </u>		
f <sub>p</sub> E <sub>T</sub>	1.00 1.5		$E_R$ $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1.2 )] 0.922	
Speed Inputs			Calc Speed Adj and		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		$f_{LC}$		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured) Base free-flow Speed, BFFS	55.0	mph mph	FFS	55.0	mph
LOS and Performanc	e Measures	<del></del>	Design (N)		
Operational (LOS)  v <sub>p</sub> = (V or DDHV) / (PHF x I x f <sub>p</sub> ) S D = v <sub>p</sub> / S LOS	N x f <sub>HV</sub> 2021 53.8 37.6 E	pc/h/ln mph pc/mi/ln	Design (N) Design LOS $v_p = (V \text{ or DDHV}) / (PHF \text{ x} \text{ x } f_p)$ S $D = v_p / S$ Required Number of Lanes		pc/h/ln mph pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed DDHV - Directional design	BFFS - Ba		$E_R$ - Exhibits 11-10, 11-12 $E_T$ - Exhibits 11-10, 11-11, $f_p$ - Page 11-18 LOS, S, FFS, $v_p$ - Exhibits 11-3		f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-11

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed Analysis Time Period	AJR Atkins 7/25/2014 PM Peak		Highway/Direction of Trave From/To Jurisdiction Analysis Year	4205-Ri Rivers ( 2018 Bt	iversSB Off to
Project Description Navy	Base ICTF			Site	
✓ Oper.(LOS)			Des.(N)	Plai	nning Data
Flow Inputs			. ,		
Volume, V AADT Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D	3256	veh/h veh/day veh/h	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub> %RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0.90 15 0 Level mi	
Calculate Flow Adjus	tments		<u> </u>		
f <sub>p</sub> E <sub>T</sub>	1.00 1.5		$E_R$ $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1.2 )] 0.930	
Speed Inputs			Calc Speed Adj and		
Lane Width		ft			
Rt-Side Lat. Clearance Number of Lanes, N	2	ft	f <sub>LW</sub>		mph mph
Total Ramp Density, TRD FFS (measured) Base free-flow Speed, BFFS	55.0	ramps/mi mph mph	TRD Adjustment FFS	55.0	mph mph
LOS and Performance	e Measures	 S	Design (N)		
Operational (LOS) $v_p = (V \text{ or DDHV}) / (PHF \times I \times f_p)$ $S$ $D = v_p / S$ LOS		pc/h/ln mph pc/mi/ln	Design (N) Design LOS $v_p = (V \text{ or DDHV}) / (PHF \text{ x} \text{ x } f_p)$ S $D = v_p / S$ Required Number of Lanes		pc/h/ln mph pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed DDHV - Directional design	BFFS - Ba		$E_R$ - Exhibits 11-10, 11-12 $E_T$ - Exhibits 11-10, 11-11, $f_p$ - Page 11-18 LOS, S, FFS, $v_p$ - Exhibits 11-3		f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-11

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Navy Base ICTF

			REEWAY	/ WEAV	NG WOF	RKSHEE	T				
General	Informati	Site Information									
Analyst AJR Agency/Company Atkins Date Performed 7/25/2014 Analysis Time Period AM Peak  Project Description Navy Base ICTF					Freeway/Dir of Travel I-526 WB Weaving Segment Location 4210 - Rivers to I-26 WB Analysis Year 2018 Build - River Center Site						
Inputs					_						
•					Erooway maximum canacity C						
Convers	sions to po	c/h Unde	r Base Co	ndition	<u> </u>	1			1		
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	$f_{HV}$	fp	v (pc/h)		
$V_{FF}$	2203	0.90	17	0	1.5	1.2	0.922	1.00	2656		
$V_{RF}$	353	0.90	17	0	1.5	1.2	0.922	1.00	426		
V <sub>FR</sub>	1149	0.90	54	0	1.5	1.2	0.787	1.00	1621		
$V_{RR}$	184	0.90	54	0	1.5	1.2	0.787	1.00	260		
V <sub>NW</sub>	2916		•	•			•	V =	4963		
V <sub>W</sub>	2047										
VR	0.412										
Configu	ration Cha	aracteris	tics								
Minimum m	aneuver lanes, l	$N_{WL}$		2 lc	Minimum weaving lane changes, LC <sub>MIN</sub> 20						
Interchange	density, ID			1.2 int/mi	Weaving lane changes, LC <sub>W</sub> 2183 I						
Minimum R	F lane changes,	, LC <sub>RF</sub>		1 lc/pc	Non-weaving lane changes, LC <sub>NW</sub>						
Minimum Fl	R lane changes,	, LC <sub>FR</sub>		1 lc/pc	Total lane changes, LC <sub>ALL</sub> 259						
Minimum R	R lane changes	, LC <sub>RR</sub>		lc/pc	Non-weaving vehicle index, I <sub>NW</sub> 2						
Weavin	g Segment	t Speed,	Density, I	Level of	Service,	and Cap	acity				
Weaving segment flow rate, v 4963 pc/h					Weaving intensity factor, W 0						
Weaving segment capacity, c <sub>w</sub> 4933 veh/h				Weaving segment speed, S 35							
Weaving segment v/c ratio 0.927					Average weaving speed, S <sub>w</sub> 39.						
	gment density,	D	47	7.3 pc/mi/ln	Average non	32.3 mph					
Level of Sei	rvice, LOS			E	Maximum we	eaving length	ı, L <sub>MAX</sub>		6821 f		
Notes		h 4h 1 - 1	4-d			-1-41		:: 0			
Chapter 13, "	egments longer to Freeway Merge a es that exceed the	and Diverge Se	gments".			solated merge	and diverge ar	eas using the	procedures of		

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F-4055

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			REEWA	/ WEAV			Γ			
General	Information	on			Site Information					
Analyst Agency/Com Date Perform Analysis Tim Project Desc	ned	AJR Atkins 7/25/20 PM Pea			Freeway/Dir of Travel I-526 WB Weaving Segment Location 4210 - Rivers to I-26 WB Analysis Year 2018 Build - River Center Site					
Inputs	mpaon wavy be	100 1011								
Weaving seg Freeway free	mber of lanes, N gment length, L <sub>s</sub> e-flow speed, FF	FS		725ft 55 mph	Segment type Freeway minimum speed, S <sub>MIN</sub> Freeway maximum capacity, C <sub>IFL</sub> Terrain type					
Convers	sions to po	li .	li .	T .	W	1		1		
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	$f_{HV}$	fp	v (pc/h)	
$V_{FF}$	1867	0.90	15	0	1.5	1.2	0.930	1.00	2230	
$V_{RF}$	290	0.90	15	0	1.5	1.2	0.930	1.00	346	
$V_{FR}$	1389	0.90	39	0	1.5	1.2	0.837	1.00	1844	
$V_{RR}$	216	0.90	39	0	1.5	1.2	0.837	1.00	287	
V <sub>NW</sub>	2517							V =	4707	
$V_W$	2190									
VR	0.465									
	ration Cha		tics		l					
	aneuver lanes, N	$V_WL$		2 lc		-	nanges, LC <sub>MIN</sub>		2190 lc/ł 2326 lc/ł	
Interchange	•									
	Flane changes,	141		1 lc/pc	Non-weaving				334 lc/ł	
	R lane changes,	111		1 lc/pc	Total lane ch		=		2660 lc/h	
	R lane changes,	TAIX			Non-weaving				219	
Weaving	g Segment	Speed,	Density, I	Level of	1					
	gment flow rate,			4707 pc/h		ensity factor,			0.630	
	gment capacity,	$c_w$		4798 veh/h	, ,	gment speed, aving speed,			34.9 mph 39.5 mph	
	gment v/c ratio	2	A	0.913	1		**		·	
Level of Ser	gment density, [ vice LOS	J	44	4.9 pc/mi/ln E	Average non				31.7 mph	
	¥100, LOO				iviaximum We	eaving length	, L <sub>MAX</sub>		7423 f	
Chapter 13, "l	egments longer the Freeway Merge a es that exceed the	nd Diverge Se	gments".	· ·		solated merge	and diverge ar	eas using the	procedures of	

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	4215-I-2 WB On	26 WB Off to I-26
Date Performed	7/25/2014		Jurisdiction	VVB OII	
Analysis Time Period	AM Peak		Analysis Year	2018 Bu Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	□Plar	nning Data
Flow Inputs					
Volume, V AADT	2556	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 17	
Peak-Hr Prop. of AADT, K		-	%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tmonte		Op/Down 76		
			Г	4.0	
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$		
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		$f_{LC}$		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	55.0	mph	FFS	55.0	mph
Base free-flow Speed, BFFS		mph			•
LOS and Performanc	e Measures	 S	Design (N)		
			Design (N)		
Operational (LOS)			Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub> 1541	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>uv</sub>	
x f <sub>p</sub> )		·	x f <sub>p</sub> )	IIV	pc/h/ln
S	55.0	mph	S P		mph
D = v <sub>p</sub> / S	28.0	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	D		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed			f
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>n</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18	44.0	TRD - Page 11-1
speed			LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	
DDHV - Directional design	hour volume		11-3		

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	4215-I-2 WB On	26 WB Off to I-26
Date Performed	7/25/2014		Jurisdiction	WB On	
Analysis Time Period	PM Peak		Analysis Year	2018 Βι Site	ıild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	☐ Plar	nning Data
Flow Inputs					
Volume, V AADT	2157	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 15	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length	Level mi	
			Up/Down %		
Calculate Flow Adjus	tments				
$f_p$	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1)] 0.930	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		$f_{LC}$		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	55.0	mph	FFS	55.0	mph
Base free-flow Speed, BFFS		mph			,
LOS and Performanc	e Measures	5	Design (N)		
0			Design (N)		
Operational (LOS)	NI v. f		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x   v_f)$	11 X 1 <sub>HV</sub> 1288	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	$N \times f_{HV}$	no/h/ln
x f <sub>p</sub> )	55.0	mnh	$x f_p$		pc/h/ln
S - v / S	55.0	mph	S		mph
D = v <sub>p</sub> / S LOS	23.4 C	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LU3	C		Required Number of Lane	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed	E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens	ity	$E_{\rm T}$ - Exhibits 11-10, 11-11,		f <sub>LC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate	FFS - Free	e-flow speed	$f_{\rm n}$ - Page 11-18	11-10	
LOS - Level of service	BFFS - Ba	ase free-flow	F	11_2	TRD - Page 11-1
speed	haurvelume		LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-4,	
DDHV - Directional design	rioui voiume		<u> </u>		

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			REEWA	/ WEAV			T			
General	Information	on			Site Information					
Analyst Agency/Con Date Perforr Analysis Tim	ned	AJR Atkins 7/25/20 AM Pe			Freeway/Dir of Travel Weaving Segment Location Analysis Year  I-526 WB 4220 - I-26 WB to I-26 EB C-D 2018 Build - River Center Site					
Project Desc <b>Inputs</b>	cription Navy Ba	ase ICTF								
Weaving con Weaving nun Weaving se Freeway free	mber of lanes, N gment length, L <sub>s</sub> e-flow speed, FF	S S		One-Sided 3 550ft 55 mph	Segment typ Freeway min Freeway max Terrain type		Freewa 1. 225 Leve			
Convers	sions to po	1	T .	l)	1	1				
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	ER	$f_{HV}$	fp	v (pc/h)	
$V_{FF}$	2009	0.90	17	0	1.5	1.2	0.922	1.00	2422	
$V_{RF}$	275	0.90	7	0	1.5	1.2	0.966	1.00	316	
$V_{FR}$	547	0.90	8	0	1.5	1.2	0.962	1.00	632	
$V_{RR}$	0	0.90	0	0	1.5	1.2	1.000	1.00	0	
V <sub>NW</sub>	2422					-	•	V =	3370	
V <sub>W</sub>	948							•		
VR	0.281									
Configu	ration Cha	racteris	tics							
Minimum m	aneuver lanes, N	$I_WL$		2 lc	Minimum we	eaving lane cl	nanges, $LC_{MIN}$		948 lc/h	
Interchange	density, ID			1.2 int/mi	Weaving lan	e changes, L	$C_{W}$		1052 lc/h	
Minimum RI	F lane changes,	$LC_{RF}$		1 lc/pc	Non-weaving lane changes, LC <sub>NW</sub>				219 lc/h	
Minimum FF	R lane changes,	$LC_{FR}$		1 lc/pc	Total lane ch	nanges, LC <sub>AL</sub>	L		1271 lc/h	
Minimum RI	R lane changes,	$LC_{RR}$		lc/pc	Non-weaving	g vehicle inde	ex, I <sub>NW</sub>		160	
Weaving	g Segment	Speed,	Density,	Level of	Service,	and Cap	acity			
Weaving se	gment flow rate,	V		3370 pc/h	_ ~	ensity factor,			0.438	
Weaving se	gment capacity,	$c_{w}$		5198 veh/h	Weaving seg	•			42.8 mph	
	gment v/c ratio			0.598	Average wea		**		42.8 mph	
	gment density, [	)	2	6.2 pc/mi/ln	1	n-weaving sp	1111		42.8 mph	
Level of Ser	vice, LOS			С	Maximum we	eaving length	ı, L <sub>MAX</sub>		5384 f	
Notes	annanta la ana 11	on the!- !	stad masiles	anath al	on transfer descri	alatad	and diverse			
Chapter 13, "	egments longer th Freeway Merge a es that exceed the	nd Diverge Se	egments".	· ·		solated merge	and diverge are	eas using the	procedures of	

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		F	REEWAY	/ WEAV	NG WOF	RKSHEE	Γ			
General	Information	on			Site Information					
Analyst Agency/Com Date Perforn Analysis Tim	ned	AJR Atkins 7/25/20 PM Pe			Freeway/Dir of Travel I-526 WB Weaving Segment Location 4220 - I-26 WB to I-26 EB CANALYSIS Year 2018 Build - River Center Sit					
Project Desc <b>Inputs</b>	cription Navy Ba	ase ICTF								
Weaving cor Weaving nur Weaving seç Freeway free	mber of lanes, N gment length, L <sub>s</sub> e-flow speed, FF	S S		One-Sided 3 550ft 55 mph	Segment typ Freeway min Freeway max Terrain type	Freeway 15 2250 Leve				
Convers	sions to po	1	1	1	11	<u> </u>		1	7	
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	f <sub>HV</sub>	fp	v (pc/h)	
$V_{FF}$	1675	0.90	15	0	1.5	1.2	0.930	1.00	2001	
$V_{RF}$	338	0.90	5	0	1.5	1.2	0.976	1.00	385	
$V_{FR}$	482	0.90	8	0	1.5	1.2	0.962	1.00	557	
$V_{RR}$	0	0.90	0	0	1.5	1.2	1.000	1.00	0	
$V_{NW}$	2001							V =	2943	
$V_W$	942									
VR	0.320									
	ration Cha aneuver lanes, I		IICS	2 lc	Minimum we	eaving lane ch	nanges, LC <sub>MIN</sub>		942 lc/h	
Interchange		<b>W</b> L		1.2 int/mi	l .	-	- 101111		1046 lc/h	
_	F lane changes,	I C		1 lc/pc	The state of the s				133 lc/h	
	R lane changes,	141		•	Total lane ch				1179 lc/h	
	R lane changes,	110			Non-weaving	- /1	-		132	
Weaving	g Segment	t Speed,	Density,							
Weaving se	gment flow rate,	, V		2943 pc/h	Weaving inte	ensity factor,	W		0.412	
Weaving se	gment capacity,	C <sub>w</sub>		5157 veh/h	, ,	gment speed,			43.4 mph	
Weaving se	gment v/c ratio			0.531	Average wea		**		43.3 mph	
	gment density, I	D	2:	2.6 pc/mi/ln	Average non		1111		43.5 mph	
Level of Ser	vice, LOS			С	Maximum we	eaving length	, L <sub>MAX</sub>		5800 ft	
Notes										
Chapter 13, "l	egments longer the Freeway Merge a s that exceed the	and Diverge Se	gments".	Ü		solated merge	and diverge ar	eas using the	procedures of	

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed	AJR Atkins 7/25/2014		Highway/Direction of Trave From/To Jurisdiction		/B 26 EB CD Off to On
Analysis Time Period	AM Peak		Analysis Year	2018 Bi Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			es.(N)	Pla	nning Data
Flow Inputs					
Volume, V AADT	2284	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 17	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1)] 0.922	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	55.0	mph	FFS	55.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performanc	e Measures	3	Design (N)		
Operational (LOS) v <sub>p</sub> = (V or DDHV) / (PHF x l	N x f <sub>HV</sub>		Design (N) Design LOS	NI f	
x f <sub>p</sub> ) S	55.0	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x x f_p)$	NXT <sub>HV</sub>	pc/h/ln
D = v <sub>p</sub> / S	25.0	mph pc/mi/ln	S		mph
LOS	25.0 C	ролили	$D = v_p / S$ Required Number of Lanes	e N	pc/mi/ln
Glossary			Factor Location	3, I <b>V</b>	
	S Snoo		l actor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed			$E_R$ - Exhibits 11-10, 11-12 $E_T$ - Exhibits 11-10, 11-11, $f_p$ - Page 11-18 LOS, S, FFS, $v_p$ - Exhibits	11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1
DDHV - Directional design	hour volume		11-3		

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed	AJR Atkins 7/25/2014		Highway/Direction of Trave From/To Jurisdiction		/B 26 EB CD Off to On
Analysis Time Period	PM Peak		Analysis Year	2018 Bi Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			es.(N)	Pla	nning Data
Flow Inputs					
Volume, V AADT	2013	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 15	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] 0.930	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	55.0	mph	FFS	55.0	mph
Base free-flow Speed, BFFS		mph		00.0	
LOS and Performanc	e Measures	3	Design (N)		
Operational (LOS) v <sub>p</sub> = (V or DDHV) / (PHF x l	N x f <sub>HV</sub>		Design (N) Design LOS	News	
x f <sub>p</sub> ) S	55.0	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x x f_p)$	N X T <sub>HV</sub>	pc/h/ln
D = v <sub>p</sub> / S	21.9	mph pc/mi/ln	S		mph
LOS	C C	рс/пп/п	D = v <sub>p</sub> / S Required Number of Lane	s N	pc/mi/ln
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed			f = F\(\frac{1}{2}\)\
V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed	D - Dens		$E_R$ - Exhibits 11-10, 11-12 $E_T$ - Exhibits 11-10, 11-11, $f_p$ - Page 11-18 LOS, S, FFS, $v_p$ - Exhibits	11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1
DDHV - Directional design	hour volume		11-3		ated: 12/0/2014 10:16 /

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			REEWAY	/ WEAV			T			
Genera	I Information	on			Site Information					
Analyst Agency/Col Date Perfor Analysis Tir Project Des	rmed	AJR Atkins 7/25/20 AM Pea			Freeway/Dir of Travel I-526 WB Weaving Segment Location 4230-I-26EBCD to International Analysis Year 2018 Build - River Center Site					
Inputs	, , , ,									
Weaving se Freeway fre	umber of lanes, Negment length, Lo	S S		3135ft 60 mph	Freeway minimum speed, S <sub>MIN</sub>					
Conver	sions to po	1	T T	T .	W	ı _				
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	f <sub>HV</sub>	fp	v (pc/h)	
$V_{FF}$	1533	0.90	10	0	1.5	1.2	0.952	1.00	1789	
$V_{RF}$	1491	0.90	20	0	1.5	1.2	0.909	1.00	1822	
$V_{FR}$	751	0.90	12	0	1.5	1.2	0.943	1.00	885	
$V_RR$	730	0.90	20	0	1.5	1.2	0.909	1.00	892	
$V_{NW}$	2681							V =	5388	
$V_{W}$	2707									
VR	0.502									
Configu	uration Cha	aracterist	tics							
Minimum n	naneuver lanes, l	N <sub>WL</sub>		2 lc	Minimum we	aving lane cl	hanges, LC <sub>MIN</sub>		lc/h	
Interchange	e density, ID			1.0 int/mi	Weaving lan	e changes, L	.C <sub>w</sub>		lc/h	
Minimum R	RF lane changes,	$LC_RF$		1 lc/pc	Non-weaving	g lane chang	es, LC <sub>NW</sub>		lc/h	
Minimum F	R lane changes,	$LC_FR$		1 lc/pc	Total lane ch	nanges, LC <sub>ALI</sub>	L		lc/h	
Minimum R	RR lane changes,	, LC <sub>RR</sub>		lc/pc	Non-weaving	g vehicle inde	ex, I <sub>NW</sub>		534	
Weavin	g Segment	t Speed,	Density, I	Level of	Service,	and Cap	acity			
Weaving se	egment flow rate egment capacity, egment v/c ratio			5388 pc/h 4549 veh/h 1.128	, ·	ensity factor, gment speed aving speed,	, S		mph mph	
ı	egment density, l	D		pc/mi/ln	Average non	n-weaving sp	eed, S <sub>NW</sub>		mph	
Level of Se	ervice, LOS			F	Maximum we	eaving length	ı, L <sub>MAX</sub>		7855 ft	
Notes										
Chapter 13,	segments longer to "Freeway Merge and the state exceed the	and Diverge Se	gments".			solated merge	and diverge are	eas using the	procedures of	

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			REEWAY	/ WEAV			Т			
General	Informati	on			Site Information					
Analyst Agency/Con Date Perforr Analysis Tin	ned	AJR Atkins 7/25/20 PM Pe			Freeway/Dir of Travel I-526 WB Weaving Segment Location 4230-I-26EBCD to Internationa Analysis Year 2018 Build - River Center Site					
Inputs	Shption Wavy Bo	300 1011								
Weaving seg Freeway free	mber of lanes, N gment length, L <sub>o</sub> e-flow speed, Fl	S S		3135ft 60 mph	Freeway minimum speed, S <sub>MIN</sub>					
Convers	sions to po	li .	T T	T .	W	1			1	
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	$f_{HV}$	fp	v (pc/h)	
$V_{FF}$	1120	0.90	9	0	1.5	1.2	0.957	1.00	1300	
$V_{RF}$	991	0.90	21	0	1.5	1.2	0.905	1.00	1217	
$V_{FR}$	893	0.90	9	0	1.5	1.2	0.957	1.00	1037	
$V_{RR}$	790	0.90	21	0	1.5	1.2	0.905	1.00	970	
V <sub>NW</sub>	2270		•	•	•	-	•	V =	4524	
V <sub>W</sub>	2254									
VR	0.498									
	ration Cha		tics		1					
Minimum m	aneuver lanes, l	$N_{WL}$		2 lc		-	nanges, LC <sub>MIN</sub>		2254 lc/h	
Interchange	•			1.0 int/mi	Weaving lan	2579 lc/h				
	F lane changes,	141		1 lc/pc	Non-weaving lane changes, LC <sub>NW</sub>				1589 lc/h	
	R lane changes,	110		1 lc/pc	Total lane ch	nanges, LC <sub>ALI</sub>	L		4168 lc/h	
Minimum RI	R lane changes,	, LC <sub>RR</sub>		lc/pc	Non-weaving vehicle index, I <sub>NW</sub> 7					
Weaving	g Segment	t Speed,	Density, I	Level of	1					
_	gment flow rate			4524 pc/h		ensity factor,			0.283	
	gment capacity,	C <sub>w</sub>		4610 veh/h	, ,	gment speed, aving speed			42.2 mph 50.1 mph	
_	gment v/c ratio	D	0.1	0.939	Average wea		**			
Weaving se Level of Ser	gment density, l	ט	3	5.7 pc/mi/ln	Average non				36.5 mph	
	VIOG, LOO			E	Maximum we	eaving length	I, L <sub>MAX</sub>		7806 f	
Chapter 13, "	egments longer the Freeway Merge a es that exceed the	and Diverge Se	gments".	· ·		solated merge	and diverge ar	eas using the	procedures of	

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BASIC FRI	EEWAY SE	GMENTS WORKSHEE	Т	
		Site Information		
AJR			el <i>I-526 W</i>	B
Atkins		From/To	4235-In:	terna Off to Interna
			On	
AM Peak		Analysis Year		ıild - River Center
Base ICTF				
		Des.(N)	☐ Plar	nning Data
3024	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 10	
	veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi	
tments		·		
		E <sub>D</sub>	1.2	
			10.952	
	ft	Guio Opeca Auj ana i		
				una sa la
2	10			mph
-	ramns/mi			mph
60.0	•			mph
00.0	•	FFS	60.0	mph
	mph			
e Measures	)	Design (N)		
		Design (N)		
N. v. f		Design LOS		
1764	pc/h/ln	l "	N x f <sub>HV</sub>	pc/h/ln
59.5	mph	<b>1</b> '		mph
29.6	pc/mi/ln			pc/mi/ln
D		·	s, N	ролили
		Factor Location		
S - Spee	d			f Evhibit 11.0
		1 '	11 12	f <sub>LW</sub> - Exhibit 11-8
	•	l '	11-13	f <sub>LC</sub> - Exhibit 11-9
		"	11 0	TRD - Page 11-11
hour volume		11-3	ı 1-∠,	
	AJR Atkins 7/25/2014 AM Peak Base ICTF  3024  tments 1.00 1.5  2 60.0  e Measures  N x f <sub>HV</sub> 1764 59.5 29.6 D  S - Spee D - Dens FFS - Free BFFS - Ba	AJR Atkins 7/25/2014 AM Peak  Base ICTF  3024 veh/h veh/day  veh/h  tments  1.00 1.5  ft ft ft 2 ramps/mi mph mph mph e Measures  N x f <sub>HV</sub> 1764 pc/h/ln 59.5 mph 29.6 pc/mi/ln D  S - Speed D - Density FFS - Free-flow speed BFFS - Base free-flow	Site Information	AJR Atkins Atkins From/To  Prom/To  Jurisdiction  AM Peak  Base ICTF  Des.(N)  Plan  3024  veh/h veh/day  Veh/day  Veh/h Veh/day  Veh/h  Veh/day  Veh/h  Veh/h  Veh/h  Veh/h  Trucks and Buses, $P_T$ General Terrain:  Level Grade $P_T$ Grade $P_T$ Calc Speed Adj and FFS  ft

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	T	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>I-526 W</i>	/B
Agency or Company	Atkins		From/To	4235-In:	terna Off to Interna
Date Performed	7/25/2014		Jurisdiction	On	
Analysis Time Period	PM Peak		Analysis Year	2018 Βι Site	ıild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	2111	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 9	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments				
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] <i>0.957</i>	
Speed Inputs			Calc Speed Adj and		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi			•
FFS (measured)	60.0	mph	TRD Adjustment		mph
Base free-flow Speed,	00.0	•	FFS	60.0	mph
BFFS		mph			
LOS and Performanc	e Measures	5	Design (N)		
0			Design (N)		
Operational (LOS)	NI v. f		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x)$	N X I <sub>HV</sub> 1226	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	0.0
x f <sub>p</sub> )	20.0		$x f_p$ )		pc/h/ln
S	60.0	mph	s		mph
$D = v_p / S$	20.4	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	С		Required Number of Lanes	s, N	·
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed			f
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>n</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18		TRD - Page 11-11
speed			LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	
DDHV - Directional design	hour volume		11-3		
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	RA	MPS AND	RAMP JUNG	CTIONS W	ORKSHE	ET				
General Info				Site Infor						
Analyst	AJR		Fr	eeway/Dir of Tr	avel I	-526 WB				
Agency or Compar			Ju	nction	4	1240-WB On fr	om International			
Date Performed		/2014		risdiction						
Analysis Time Peri			Ar	alysis Year	2	2018 Build - Riv	ver Center Site			
Project Description	Navy Base IC	TF								
Inputs		le v						1		
Jpstream Adj Ram	р	1 '	ber of Lanes, N	2				Downstre	am Adj	
		Ramp Numbe	•	1				Ramp		
☐ Yes ☐ C	)n	Acceleration L	ane Length, L <sub>A</sub>	875				□Yes	On	
☑ No □ C	Off	Deceleration L	ane Length L <sub>D</sub>					☑ No	Off	
		Freeway Volu	me, V <sub>F</sub>	3024				INO		
<sub>-up</sub> = ft		Ramp Volume	e, V <sub>D</sub>	419				L <sub>down</sub> =	ft	
			-Flow Speed, S <sub>FF</sub>	60.0						
/ <sub>u</sub> = veh	/h	1	ow Speed, S <sub>FR</sub>	45.0				$V_D =$	veh/h	
Conversion	to nc/h Hn		* 110	10.0						
	∪ γ ∨					Τ,	Τ .	1		
(pc/h)	(Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	f <sub>p</sub>	v = V/PHF	x t <sub>HV</sub> x f <sub>p</sub>	
Freeway	3024	0.90	Level	10	0	0.952	1.00	3	528	
Ramp	419	0.90	Level	21	0	0.905	1.00		514	
UpStream										
DownStream										
<b>-</b> 4: 4:		Merge Areas			F - 4: 4:	<b>.</b>	Diverge Areas			
Estimation of	or v <sub>12</sub>				Estimation	on of v <sub>12</sub>				
	$V_{12} = V_{F}$	(P <sub>FM</sub> )				V <sub>12</sub>	$= V_R + (V_F - V_I)$	<sub>R</sub> )P <sub>FD</sub>		
- <sub>EQ</sub> =	(Equ	ation 13-6 or	13-7)		L <sub>EQ</sub> =		(Equation 13	3-12 or 13-1	3)	
P <sub>FM</sub> =	1.000	using Equat	ion (Exhibit 13-6)		P <sub>FD</sub> =		using Equation	on (Exhibit 13	3-7)	
/ <sub>12</sub> =	3528	pc/h			V <sub>12</sub> =		pc/h		•	
/ <sub>3</sub> or V <sub>av34</sub>		•	13-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>		pc/h (Equation	13-14 or 13-1	7)	
Is V <sub>3</sub> or V <sub>av34</sub> > 2,	-		,		Is $V_3$ or $V_{av34} > 2,700$ pc/h? $\square$ Yes $\square$ No					
Is V <sub>3</sub> or V <sub>av34</sub> > 1.							☐Yes ☐No			
			3-16, 13-18, or		1		pc/h (Equation		3-18. or	
Yes,V <sub>12a</sub> =	13-19)				If Yes,V <sub>12a</sub> =		13-19)			
Capacity Ch	ecks				Capacity	/ Checks				
	Actual	C	Sapacity	LOS F?		Actu		apacity	LOS F?	
					V <sub>F</sub>		Exhibit 13	-8		
$V_{FO}$	4042	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>	Exhibit 13	-8		
10					V <sub>R</sub>		Exhibit 13	3-		
							10	<u> </u>		
		ntluence A	rea			terina Div	erae Influei	nce Area		
Flow Enterin				\" \ " \ O	FIOW EIT				10 10 1	
Flow Enterin	Actual	Max	Desirable	Violation?		Actual	Max Des	sirable	Violation'	
V <sub>R12</sub>	Actual 4042	Max Exhibit 13-8	Desirable 4600:All	Violation?	V <sub>12</sub>	Actual	Max Des Exhibit 13-8			
V <sub>R12</sub> Level of Ser	Actual 4042 <b>vice Deterr</b>	Max Exhibit 13-8	Desirable 4600:All <b>if not F</b> )		V <sub>12</sub> Level of	Actual Service D	Max Des Exhibit 13-8 Determination	on (if not		
V <sub>R12</sub> Level of Ser	Actual 4042 <b>vice Deterr</b> + 0.00734 v <sub>R</sub> +	Max Exhibit 13-8	Desirable 4600:All <b>if not F</b> )		V <sub>12</sub> Level of	Actual  Service D  0 <sub>R</sub> = 4.252 +	Max Des Exhibit 13-8	on (if not		
V <sub>R12</sub> Level of Ser	Actual 4042 <b>vice Deterr</b> + 0.00734 v <sub>R</sub> +	Max Exhibit 13-8	Desirable 4600:All <b>if not F</b> )		V <sub>12</sub> Level of	Actual Service D	Max Des Exhibit 13-8 Determination	on (if not		
$V_{R12}$ Level of Ser $D_R = 5.475$ $D_R = 31.3 \text{ (pc.)}$	Actual 4042 <b>vice Detern</b> + 0.00734 v <sub>R</sub> + 1	Max Exhibit 13-8	Desirable 4600:All <b>if not F</b> )		V <sub>12</sub> Level of  D <sub>R</sub> = (po	Actual  Service D  0 <sub>R</sub> = 4.252 +	Max Des Exhibit 13-8 Determination	on (if not		
$V_{R12}$ Level of Ser $D_R = 5.475$ $D_R = 31.3 \text{ (pc.)}$	Actual 4042 Vice Deterr + 0.00734 v <sub>R</sub> + 1 /mi/ln) vit 13-2)	Max Exhibit 13-8	Desirable 4600:All <b>if not F</b> )		V <sub>12</sub> Level of  D <sub>R</sub> = (po	Actual  Service D  R = 4.252 + c/mi/ln)	Max Det Exhibit 13-8 Petermination 0.0086 V <sub>12</sub> - 0	on (if not		
$V_{R12}$ Level of Ser $D_R = 5.475$ $D_R = 31.3 \text{ (pc. OS} = D \text{ (Exhib)}$ Speed Determines	Actual 4042  *Vice Detern* + 0.00734 v <sub>R</sub> + 1/mi/ln) bit 13-2)  **rmination**	Max Exhibit 13-8	Desirable 4600:All <b>if not F</b> )		V <sub>12</sub> Level of  D <sub>R</sub> = (po	Actual  Service D  R = 4.252 + c/mi/ln)  xhibit 13-2)	Max Det Exhibit 13-8 Petermination 0.0086 V <sub>12</sub> - 0	on (if not		
$V_{R12}$ Level of Ser $D_R = 5.475$ $D_R = 31.3$ (pc. OS = D (Exhib)  Speed Determined Ms = 0.464 (E	Actual 4042  *Vice Deterr* + 0.00734 v R + 10.00734	Max Exhibit 13-8	Desirable 4600:All <b>if not F</b> )		V <sub>12</sub> Level of  D <sub>R</sub> = (po LOS = (E: Speed D D <sub>s</sub> = (Ex	Actual  Service E  O <sub>R</sub> = 4.252 + c/mi/ln)  xhibit 13-2)  eterminat  khibit 13-12)	Max Det Exhibit 13-8 Determination 0.0086 V <sub>12</sub> - 0	on (if not		
$V_{R12}$ Level of Ser $D_{R} = 5.475$ $D_{R} = 31.3 \text{ (pc)}$ $D_{R} = 0.464 \text{ (E)}$	Actual 4042  vice Detern + 0.00734 v <sub>R</sub> + 1  /mi/ln)  bit 13-2)  rmination  (xibit 13-11) h (Exhibit 13-11)	Max Exhibit 13-8	Desirable 4600:All <b>if not F</b> )		$V_{12}$ Level of $D_R = (pc)$ LOS = (E: Speed D $D_S = (Ex)$ $D_R = (Ex)$	Actual  Service E  O <sub>R</sub> = 4.252 +  c/mi/ln)  xhibit 13-2)  eterminat  khibit 13-12)  ch (Exhibit 13-1	Max Det Exhibit 13-8 Determination 0.0086 V <sub>12</sub> - 0	on (if not		
$V_{R12}$ Level of Ser $D_R = 5.475$ $D_R = 31.3 \text{ (pc. OS} = D \text{ (Exhib)}$ Speed Deter $M_S = 0.464 \text{ (E}$ $S_R = 51.6 \text{ mpi}$ $S_0 = N/A \text{ mph}$	Actual 4042  *Vice Deterr* + 0.00734 v R + 10.00734	Max Exhibit 13-8	Desirable 4600:All <b>if not F</b> )		$\begin{array}{c} V_{12} \\ \hline \\ \textbf{Level of} \\ \hline \\ D_R = & (polynomial polynomial polynomi$	Actual  Service E  O <sub>R</sub> = 4.252 + c/mi/ln)  xhibit 13-2)  eterminat  khibit 13-12)	Max Det Exhibit 13-8 Determination 0.0086 V <sub>12</sub> - 0	on (if not		

		RAI	MPS AND	RAMP JUN	CTIONS W	/ORKSH	EET				
General	Inform		•		Site Infor						
Analyst		AJR		Fr	eeway/Dir of Tr		I-526 \	VB			
Agency or Co	ompany	Atkin	S	Ju	inction		4240-\	NB On from	nternational		
ate Perform	ned	7/25/	2014	Ju	ırisdiction						
nalysis Tim		PM P		Ar	nalysis Year		2018 E	Build - River (	Center Site		
	ription I	Navy Base ICT	F								
nputs											
Jpstream Ac	lj Ramp		Freeway Num	ber of Lanes, N	2					Downstre	am Adj
			Ramp Number	r of Lanes, N	1					Ramp	-
Yes	☐ On		Acceleration L	ane Length, L <sub>A</sub>	875					□Yes	On
✓ No	Off		Deceleration L	ane Length L <sub>D</sub>							_
<b>▼</b> NO			Freeway Volui		2111					✓No	Off
up =	ft		Ramp Volume	'	625					L <sub>down</sub> =	ft
up.				Flow Speed, S <sub>FF</sub>	60.0						
$V_u = \frac{\text{veh/h}}{\text{Ramp Free-Flow Speed, S}_{FR}}$ 45.0										V <sub>D</sub> =	veh/h
Conversion to pc/h Under Base Conditions											
onvers	ion to	) pc/n Und ∀	der Base (	Sonaitions	1	1	_				
(pc/h	)	v (Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	$f_p$	v = V/PHI	$F \times f_{HV} \times f_{p}$
Freeway		2111	0.90	Level	9	0	0	.957	1.00		2451
Ramp		625	0.90	Level	12	0	_	.943	1.00		736
JpStream .											
DownStrean	n										
				Di	verge Areas						
Estimation of v <sub>12</sub>						Estimat	ion c	of v <sub>12</sub>			
$V_{12} = V_F (P_{FM})$								V <sub>12</sub> = V	<sub>R</sub> + (V <sub>F</sub> - V <sub>R</sub>	)P <sub>ED</sub>	
Equation 13-6 or 13-7)						L <sub>EQ</sub> =			Equation 13-		13)
) <sub>FM</sub> =				ion (Exhibit 13-6)		P <sub>FD</sub> =			sing Equatio		
rm / <sub>12</sub> =		2451		IOTT (EXHIBIT 10 0)	'	V <sub>12</sub> =			ong Equation c/h	II (EXIIIDIC I	0-1)
				10 14 0= 10 17)		·-			c/h (Equation 1	2 11 or 12	17\
or V <sub>av34</sub>	> 0.700			13-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>	× 0 =			3-14 01 13-	17)
		pc/h? Ye							Yes No		
		V <sub>12</sub> /2		10 10 10		is v <sub>3</sub> or v <sub>av</sub>	<sub>34</sub> > 1.5		Yes ☐ No	- 10 10 1	0.40
Yes,V <sub>12a</sub> =		pc/n 13-19)		s-16, 13-18, or		If Yes,V <sub>12a</sub> =	=		c/h (Equation -19)	n 13-16, 1	3-18, or
Capacity	/ Chec		<u>'</u>			Capacit	v Ch		10)		
, , , , , , , , , , , , , , , , , , ,		Actual	С	apacity	LOS F?		<i>)</i>	Actual	Car	pacity	LOS F?
			İ	эрэгч		V <sub>F</sub>			Exhibit 13-8		
					l		1/		Exhibit 13-8	_	
$V_{FC}$	)	3187	Exhibit 13-8		No	$V_{FO} = V_{F}$	· · VR		Exhibit 13-		
						$V_R$			10	1	
low En	terina	Merae In	fluence A	rea		Flow Er	terir	na Diver	ge Influen	ce Area	)
	]	Actual		Desirable	Violation?			Actual	Max Desi		Violation?
V <sub>R12</sub> 3187 Exhibit 13-8 4600:All No						V <sub>12</sub>			Exhibit 13-8		
evel of Service Determination (if not F)							f Ser	vice Det		n (if not	· <i>F</i> )
			0.0078 V <sub>12</sub> - 0.0			Level of Service Determination (if not F)					
			7.0070 V <sub>12</sub> 0.0	70027 L <sub>A</sub>		$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$					
	.5 (pc/mi/	•				1 ., ,,	oc/mi/l	,			
	(Exhibit 1	-				_		13-2)			
Speed D	peed Determination							minatio	า		
M <sub>S</sub> = 0.3	= 0.337 (Exibit 13-11)						D <sub>s</sub> = (Exhibit 13-12)				
							S <sub>R</sub> = mph (Exhibit 13-12)				
11							S <sub>0</sub> = mph (Exhibit 13-12)				
0							S = mph (Exhibit 13-13)				
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Analyst Agency/Com Date Perform	Information pany				Site Info					
Agency/Com Date Perform	pany				Site iiiio	rmation				
	pency/Company Atkins ate Performed 7/25/2014 alysis Time Period AM Peak oject Description Navy Base ICTF					Freeway/Dir of Travel I-526 WB Weaving Segment Location 4250-Montague to Dorchester Analysis Year 2018 Build - River Center Site				
nputs	nption <i>Navy B</i> a	ase ICTF								
Weaving configuration  Weaving number of lanes, N  Weaving segment length, L <sub>S</sub> Freeway free-flow speed, FFS  6					Segment type Freeway minimum speed, S <sub>MIN</sub> Freeway maximum capacity, C <sub>IFL</sub> Terrain type					
Convers	ions to po	1	T T	ľ	11					
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	$f_{HV}$	fp	v (pc/h)	
/ <sub>FF</sub>	2710	0.90	9	0	1.5	1.2	0.957	1.00	3147	
$I_{RF}$	434	0.90	9	0	1.5	1.2	0.957	1.00	504	
/ <sub>FR</sub>	733	0.90	14	0	1.5	1.2	0.935	1.00	871	
/ <sub>RR</sub>	117	0.90	14	0	1.5	1.2	0.935	1.00	139	
/ <sub>NW</sub>	3286							V =	4661	
/ <sub>W</sub>	1375							•		
/R	0.295									
	ration Cha		tics		1					
	neuver lanes, l	$N_{WL}$		2 lc		-	nanges, LC <sub>MIN</sub>		1375 lc/h	
Interchange	•			1.0 int/mi	Weaving lan	_	**		1531 lc/h	
	lane changes,	141		1 lc/pc	Non-weaving	•			614 lc/h	
	lane changes,	111		1 lc/pc	Total lane ch				2145 lc/h	
	R lane changes,	1417			Non-weaving				312	
<u> Weaving</u>	Segment	Speed,	Density, I	_evel of	1		·			
0 0	ment flow rate,			4661 pc/h		ensity factor, gment speed,			0.430 43.7 mph	
	ment capacity,	C <sub>W</sub>	,	5598 veh/h	' '	aving speed,			45.7 mph	
0 0	ment v/c ratio	٦.	2.0	0.797		aving speed, n-weaving spe	**		40.5 mph	
vveaving seg Level of Serv	gment density, [ vice_LOS	J	35	5.5 pc/mi/ln E	_	eaving length	1111			
					IVIAXIIIIUIII W		, L <sub>MAX</sub>		5530 ft	
Chapter 13, "F	gments longer the reeway Merge as that exceed the	and Diverge Se	gments".			solated merge	and diverge are	eas using the	procedures of	

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			REEWA	WEAV			Т		
General	Information	on			Site Info	rmation			
Analyst Agency/Con Date Perforr Analysis Tin Project Desc	med	AJR Atkins 7/25/20 PM Pea			Freeway/Dir of Travel I-526 WB Weaving Segment Location 4250-Montague to Dorchester Analysis Year 2018 Build - River Center Site				
Inputs									
Weaving seg	mber of lanes, N gment length, L <sub>e</sub> e-flow speed, FI	S FS		950ft 60 mph	Segment typ Freeway min Freeway max Terrain type	imum speed,			Freeway 19 2300 Leve
Convers	sions to po	T	ľ	T .	W	1		1	1
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	$f_{HV}$	fp	v (pc/h)
$V_{FF}$	2216	0.90	8	0	1.5	1.2	0.962	1.00	2561
$V_{RF}$	602	0.90	8	0	1.5	1.2	0.962	1.00	696
$V_{FR}$	520	0.90	16	0	1.5	1.2	0.926	1.00	624
$V_{RR}$	142	0.90	16	0	1.5	1.2	0.926	1.00	170
$V_{NW}$	2731							V =	4051
$V_{W}$	1320								
VR	0.326								
Configu	ration Cha	aracteris	tics		,				
Minimum m	aneuver lanes, l	$N_{WL}$		2 lc	Minimum we	eaving lane cl	nanges, LC <sub>MIN</sub>		1320 lc/h
Interchange	density, ID			1.0 int/mi	Weaving lan	e changes, L	.C <sub>w</sub>		1476 lc/h
Minimum R	F lane changes,	$LC_{RF}$		1 lc/pc	Non-weaving	g lane chang	es, LC <sub>NW</sub>		500 lc/h
Minimum FF	R lane changes,	$LC_{FR}$		1 lc/pc	Total lane ch	nanges, LC <sub>ALI</sub>	L		1976 lc/h
Minimum RI	R lane changes,	, LC <sub>RR</sub>		lc/pc	Non-weaving	g vehicle inde	ex, I <sub>NW</sub>		259
Weavin	g Segment	t Speed,	Density, l	Level of	Service,	and Cap	acity		
Weaving se	gment flow rate	, V		4051 pc/h		ensity factor,			0.403
Weaving se	gment capacity,	, C <sub>W</sub>		5550 veh/h		gment speed			45.0 mph
	gment v/c ratio	_	_	0.702	1	aving speed,	**		47.1 mph
ı	gment density, I	ט	30	0.0 pc/mi/ln	Average non				44.0 mph
Level of Ser	VICE, LUS			D	Maximum we	eaving length	I, L <sub>MAX</sub>		5863 ft
Notes a. Weaving s	egments longer tl	han the calcula	ted maximum le	ength should b	oe treated as is	solated merge	and diverge ar	eas using the	procedures of
	Freeway Merge a			he level of ser	vice is "F".				

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	T	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>I-526 W</i>	/B
Agency or Company	Atkins		From/To	4255-D	orches Off to
Date Performed	7/25/2014		Jurisdiction	Dorches	s On
Analysis Time Period	AM Peak		Analysis Year	2018 Βι Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	☐ Plar	nning Data
Flow Inputs					
Volume, V	3144	veh/h	Peak-Hour Factor, PHF	0.90	
AADT		veh/day	%Trucks and Buses, P <sub>T</sub>	9	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length	Level mi	
DDIIV = AADI X K X D		VCII/II	Up/Down %	1111	
Calculate Flow Adjus	tments				
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] <i>0.957</i>	
Speed Inputs			Calc Speed Adj and		
Lane Width		ft	<u> </u>		
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	1	00.0	·
Base free-flow Speed,	00.0	·	FFS	60.0	mph
BFFS		mph			
LOS and Performanc	e Measures	3	Design (N)		
Operational (LOS)			Design (N)		
Operational (LOS)	N v f		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x)$	1N X 1 <sub>HV</sub> 1825	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	$N \times f_{HV}$	20/b/lp
x f <sub>p</sub> )	EO 1	mnh	x f <sub>p</sub> )		pc/h/ln
D = 11 / C	59.1	mph	s		mph
$D = v_p / S$	30.9	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	D		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed			f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens	ity	E <sub>R</sub> - Exhibits 11-10, 11-12		_,,
v <sub>n</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		se free-flow	f <sub>p</sub> - Page 11-18	44.0	TRD - Page 11-11
speed			LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-2,	
DDHV - Directional design	hour volume		11-3		

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed Analysis Time Period	AJR Atkins 7/25/2014 PM Peak		Highway/Direction of Trave From/To Jurisdiction Analysis Year	4255-De Dorches	orches Off to
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D	2818	veh/h veh/day veh/h	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub> %RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0.90 8 0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub> E <sub>T</sub>	1.00 1.5		$E_R$ $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1.2 1)] 0.962	
Speed Inputs			Calc Speed Adj and		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f		mph
Number of Lanes, N	2		f <sub>LW</sub>		•
Total Ramp Density, TRD	_	ramps/mi	f <sub>LC</sub>		mph
FFS (measured) Base free-flow Speed, BFFS	60.0	mph mph	TRD Adjustment	60.0	mph mph
LOS and Performanc	e Measures	 S	Design (N)		
Operational (LOS)  v <sub>p</sub> = (V or DDHV) / (PHF x l x f <sub>p</sub> ) S D = v <sub>p</sub> / S LOS		pc/h/ln mph pc/mi/ln	Design (N) Design LOS $v_p = (V \text{ or DDHV}) / (PHF \times x \times f_p)$ S $D = v_p / S$ Required Number of Lanes		pc/h/ln mph pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed DDHV - Directional design	BFFS - Ba		$E_R$ - Exhibits 11-10, 11-12 $E_T$ - Exhibits 11-10, 11-11, $f_p$ - Page 11-18 LOS, S, FFS, $v_p$ - Exhibits 11-3	11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1

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			REEWA	( WEAV	1		Τ		
Genera	I Informati	on			Site Info	rmation			
	rmed	AJR Atkins 7/25/20 AM Pe			Freeway/Dir Weaving Seg Analysis Yea	gment Location		WB Dorchester to Build - River	
Inputs					ı				
Weaving no Weaving se	onfiguration umber of lanes, Negment length, Lee-flow speed, F	S		One-Sided 3 1750ft 60 mph	Segment typ Freeway min Freeway max Terrain type	imum speed,			Freewa 1 230 Leve
Conver	sions to po	c/h Unde	r Base Co	ndition	S				
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	$f_{HV}$	fp	v (pc/h)
$V_{FF}$	2318	0.90	9	0	1.5	1.2	0.957	1.00	2691
$V_{RF}$	464	0.90	17	0	1.5	1.2	0.922	1.00	559
$V_{FR}$	826	0.90	9	0	1.5	1.2	0.957	1.00	959
$V_{RR}$	166	0.90	17	0	1.5	1.2	0.922	1.00	200
V <sub>NW</sub>	2891		•	•	•		•	V =	4409
V <sub>W</sub>	1518							•	
VR	0.344								
Config	uration Cha	aracteris	tics						
Minimum r	maneuver lanes,	N <sub>WL</sub>		2 lc	Minimum we	eaving lane cl	nanges, LC <sub>MIN</sub>		1518 lc/h
Interchang	e density, ID			1.0 int/mi	Weaving lan	e changes, L	$C_{W}$		1751 lc/l
Minimum F	RF lane changes,	, LC <sub>RF</sub>		1 lc/pc	Non-weaving	g lane chang	es, LC <sub>NW</sub>		966 lc/h
Minimum F	R lane changes	, LC <sub>FR</sub>		1 lc/pc	Total lane ch	nanges, LC <sub>ALI</sub>	L		2717 lc/h
Minimum F	RR lane changes	, LC <sub>RR</sub>		lc/pc	Non-weaving	g vehicle inde	ex, I <sub>NW</sub>		506
Weavir	ng Segmen	t Speed,	Density, I	Level of	Service,	and Cap	acity		
Weaving s	egment flow rate	, V		4409 pc/h		ensity factor,			0.320
Weaving s	egment capacity	, c <sub>w</sub>		5656 veh/h	1	gment speed			44.2 mpł
_	egment v/c ratio			0.746	1	aving speed,	**		49.1 mph
_	egment density,	D	33	3.2 pc/mi/ln	Average nor		1111		42.0 mph
	ervice, LOS			D	Maximum w	eaving length	ı, L <sub>max</sub>		6064 f
Notes		L				-1-4- !			
Chapter 13,	segments longer t "Freeway Merge a	and Diverge Se	egments".	· ·		solated merge	and diverge ar	eas using the	procedures of
	nes that exceed the 2012 University of I			ie ievėl Oi Sei		M Version 6.4	ıı Ge	nerated: 12/1	1/2014 4:07

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			REEWA	( WEAV			<u> </u>			
General	Information	on			Site Info	rmation				
Analyst Agency/Com Date Perforr Analysis Tim	ned	AJR Atkins 7/25/20 PM Pe			Weaving Seg	Freeway/Dir of Travel I-526 WB Weaving Segment Location 4260-Dorchester to Leeds Analysis Year 2018 Build - River Center Sit				
Project Desc <b>Inputs</b>	cription Navy Ba	ise ICTF								
Weaving cor Weaving nur Weaving se Freeway free	mber of lanes, N gment length, L <sub>s</sub> e-flow speed, FF	rs		One-Sided 3 1750ft 60 mph	Segment type Freeway minimum speed, S <sub>MIN</sub> Freeway maximum capacity, C <sub>IFL</sub> Terrain type					
Convers	sions to po	ı	1	1	1		1 .		1	
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	f <sub>HV</sub>	fp	v (pc/h)	
V <sub>FF</sub>	2561	0.90	7	0	1.5	1.2	0.966	1.00	2945	
$V_{RF}$	486	0.90	17	0	1.5	1.2	0.922	1.00	586	
V <sub>FR</sub>	257	0.90	7	0	1.5	1.2	0.966	1.00	296	
$V_{RR}$	49	0.90	17	0	1.5	1.2	0.922	1.00	59	
$V_{NW}$	3004							V =	3886	
V <sub>W</sub>	882									
√R	0.227									
	ration Cha		tics		T					
Minimum ma	aneuver lanes, N	1 <sub>WL</sub>		2 lc	1	_	hanges, LC <sub>MIN</sub>		882 lc/h	
Interchange	•			1.0 int/mi	Weaving lan	-	**		1115 lc/h	
	F lane changes,	141		1 lc/pc	Non-weaving	-			990 lc/h	
	R lane changes,	111		1 lc/pc	Total lane ch	nanges, LC <sub>AL</sub>	L		2105 lc/h	
Minimum RI	R lane changes,	LC <sub>RR</sub>		lc/pc	Non-weaving	g vehicle inde	ex, I <sub>NW</sub>		526	
Weaving	g Segment	Speed,	Density,	Level of	ı .	-				
· ·	gment flow rate,			3886 pc/h	_ ~	ensity factor,			0.261	
_	gment capacity,	$c_{w}$		5988 veh/h	Weaving seg	•			48.1 mph	
•	gment v/c ratio	`	0	0.627	Average wea		**		50.7 mph	
weaving se Level of Ser	gment density, [	J	2	6.9 pc/mi/ln C	1	n-weaving sp	1111		47.4 mph	
	VIOE, LOO			<u> </u>	Maximum we	eaving lengtr	I, L <sub>MAX</sub>		4814 f	
Chapter 13, "	egments longer th Freeway Merge a es that exceed the	nd Diverge Se	egments".	•		solated merge	and diverge are	eas using the	procedures of	

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		Beeds Off to Leeds
Agency or Company	Atkins		From/To	On	
Date Performed	7/25/2014		Jurisdiction	2018 Bi	ıild - River Center
Analysis Time Period	AM Peak		Analysis Year	Site	
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	∐ Plar	nning Data
Flow Inputs	0700	a la /la	Deals Have Factor DUE	0.00	
Volume, V AADT	2782	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 10	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length	Level	
DDHV = AADTX K X D		ven/n	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments		·		
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] 0.952	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performanc	e Measures	 S	Design (N)		
			Design (N)		
Operational (LOS)			Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x I)$	N x f <sub>HV</sub> 1623	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f	
x f <sub>p</sub> )		p seemen	x f <sub>p</sub> )	пν	pc/h/ln
S	60.0	mph	S P		mph
$D = v_p / S$	27.1	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	D		Required Number of Lanes	s, N	<b>P</b> 3
Glossary			Factor Location	<u>·</u>	
N - Number of lanes	S - Spee	ed			f Evhihit 11 0
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>p</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18	11 2	TRD - Page 11-1
speed	hourveluse		LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-∠,	
DDHV - Directional design	riour volume		<u>                                     </u>		

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	T	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>I-526 W</i>	/B
Agency or Company	Atkins		From/To	4265-Le	eeds Off to Leeds
Date Performed	7/25/2014		Jurisdiction	On	
Analysis Time Period	PM Peak		Analysis Year	2018 Βι Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	☐ Plar	nning Data
Flow Inputs					
Volume, V AADT	3047	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 9	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments				
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] <i>0.957</i>	
Speed Inputs			Calc Speed Adj and		
Lane Width		ft	, ,		
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	·
Base free-flow Speed,		•	14.2	60.0	mph
BFFS		mph			
LOS and Performanc	e Measures	<u> </u>	Design (N)		
Operational (LOS)			Design (N)		
$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f		Design LOS		
$x f_p$ )	1769	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	$N \times f_{HV}$	pc/h/ln
S	59.5	mph	x f <sub>p</sub> )		ролин
D = v <sub>p</sub> / S	29.7	pc/mi/ln	S		mph
LOS	29.7 D	рслили	$D = v_p / S$		pc/mi/ln
	D		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed	E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens	sity	$E_{\rm T}$ - Exhibits 11-10, 11-11,		f <sub>LC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate	FFS - Free	e-flow speed	$f_{\rm n}$ - Page 11-18		TRD - Page 11-11
LOS - Level of service	BFFS - Ba	ase free-flow	LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2	IND - Laye 11-11
speed DDHV - Directional design	hour volume		11-3	,	
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Site Information		RA	MPS AND	RAMP JUN	CTIONS W	/ORKSHI	EET					
Analyst Manipus AJR AJR AJR Species Substitution AJR AJR AJR AJR Species of Company AJR Section 1725/2014 Junction 4270-WB On from Leeds 1725/2014 Junction AJR Peak Analysis Year 2018 Build - River Center Site 1700ect Description Navy Base ICTF  **Torpus**	General Info											
Date Performed				Fr			I-526 V	VB				
Amalysis   Year   2018 Build - River Center Site	Agency or Compan	ıy Atkin	IS	Ju	ınction		4270-V	VB On from I	_eeds			
Project Description   Navy Base ICTF   Imputs	Date Performed	7/25/	/2014									
Inputs				Ar	nalysis Year		2018 B	uild - River (	Center Site			
perferam Adj Ramp		Navy Base ICT	ſF									
Yes	nputs											
Yes	Jpstream Adj Ram	ıp	1		2					Downstre	am Adj	
Very			Ramp Numbe	r of Lanes, N	1					Ramp		
Deceleration Lane Length $L_D$ Freeway Volume, $V_F$ 2782 $V_U = V_D = $	Yes	)n	Acceleration L	ane Length, L <sub>A</sub>	825					□Yes	On	
	√No □C	)ff	Deceleration L	ane Length L <sub>D</sub>							_	
	<u>. 140                                   </u>	711	Freeway Volu	5						MO	□Off	
Veh/h   Ramp Free-Flow Speed, SFF   60.0   Veh/hr   PHF   Free-Flow Speed, SFF   45.0   Veh/hr   PHF   Terrain   %Truck   %Rv   fHV   fp   V = V/PHF x fHV   Freeway   2782   0.90   Level   10   0   0.952   1.00   3246   324	up = ft		1		222					L <sub>down</sub> =	ft	
Venum				11								
Conversion to pc/h Under Base Conditions	$t_{\rm u} = {\rm veh}/{\rm veh}$						$V_D =$	veh/h				
(pchh)	2	40 00/01/0	45.0									
(pch) (Vehhr) PHF Terrain %Truck %RV T <sub>HV</sub> T <sub>p</sub> V = VIPHF XT <sub>HV</sub> Freeway 2782 0.90 Level 10 0 0.952 1.00 3246  Samp 222 0.90 Level 19 0 0.913 1.00 270  JpStream	onversion	1 -		Conditions	1	1						
Second Description   Second	(pc/h)		PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	$f_p$	v = V/PHI	$F \times f_{HV} \times f_{p}$	
Depth   Dept	reeway	10	0	0.	952	1.00		3246				
DownStream	•	222	0.90	Level	19	0	0.	913	1.00		270	
DownStream	JpStream											
Estimation of $v_{12}$   Estimation of $v_{12}$												
$ \begin{array}{c} V_{12} = V_F (P_{FM}) \\ EQ = & (Equation 13-6 \text{ or } 13-7) \\ EM = & 1.000 \text{ using Equation (Exhibit 13-6)} \\ 1_{12} = & 3246 \text{ pc/h} \\ 3_{12} = & 3246 \text{ pc/h} \\ 3_{13} = &$			_	Di	verge Areas							
	stimation c		Estimat	ion o	f v <sub>12</sub>							
Filip				V <sub>12</sub> = V	R + (V <sub>F</sub> - V <sub>R</sub>	)P <sub>FD</sub>						
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	. <sub>EO</sub> =		L <sub>EO</sub> =		 (E	Equation 13-	12 or 13-1	13)				
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$					1				-			
$V_{3}$ or $V_{av34}$ 0 pc/h (Equation 13-14 or 13-17) $V_{3}$ or $V_{av34}$ 2,700 pc/h? $V_{3}$ or $V_{av3$				,						,	- /	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$			•	13_1/ or 13_17)		I				3_14 or 13_	17)	
S				10-14-01-10-17)			> 2 7			0 14 01 10	'''	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$												
Capacity Checks  Actual Capacity LOS F? Actual Capacity LOS F? $V_{FO}$ 3516 Exhibit 13-8  Flow Entering Merge Influence Area  Actual Max Desirable Violation? $V_{R12}$ 3516 Exhibit 13-8 4600:All No $V_{12}$ Exhibit 13-8 Exhibit 13-8  Level of Service Determination (if not F) $D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$ $D_R = 27.6 \text{ (pc/mi/ln)}$ $D_S = C \text{ (Exhibit 13-2)}$ Speed Determination $D_S = 0.378 \text{ (Exhibit 13-11)}$				R-16 13-18 or						n 13 <sub>-</sub> 16 1	3_18 or	
Capacity ChecksActualCapacityLOS F?ActualCapacityLOS F? $V_F$ Sthibit 13-8 $V_F$ Exhibit 13-8 $V_F$ $V_F$ Sthibit 13-8 $V_F$ Exhibit 13-8 $V_F$ $V_F$ Exhibit 13-8 $V_F$ $V_F$ Exhibit 13-8 $V_F$ $V_F$ Exhibit 13-8 $V_F$ $V_F$ $V_F$ $V_F$	Yes,V <sub>12a</sub> =			)-10, 10-10, of		If Yes,V <sub>12a</sub> =	=			11 10-10, 1	J-10, OI	
$V_{FO} = V_{F} - V_{R} $ Exhibit 13-8 $V_{FO} = V_{F} - V_{R} $ Exhibit 13-8 $V_{R} = V_{F} - V_{R} $ Exhibit 13-8 $V_{R} = V_{F} - V_{R} = V_{F} - V_{R} $ Exhibit 13-8 $V_{R} = V_{F} - V_{R} = V_{R} - V_{R} = V_{R} - V_{R} - V_{R} = V_$	Capacity Ch	ecks				Capacit	y Ch	ecks				
$V_{FO} = V_F - V_R \qquad \qquad \text{Exhibit 13-8} \qquad \qquad V_R \qquad \qquad \text{Exhibit 13-8} \qquad \qquad V_R \qquad \qquad \text{Exhibit 13-8} \qquad \qquad V_R \qquad \qquad \text{Exhibit 13-8} \qquad V_R \qquad \qquad \text{Exhibit 13-8} \qquad V_R \qquad \qquad \text{Exhibit 13-8} \qquad V_R \qquad \qquad V_R \qquad \qquad V_R		Actual	С	apacity	LOS F?			Actual	Cap	acity	LOS F?	
Flow Entering Merge Influence Area    Actual   Max Desirable   Violation?   Actual   Max Desirable   Violation?   Exhibit 13-8   Violation?   Actual   Max Desirable   Violation?   Exhibit 13-8   Violation?   Violation?   Violation?   Violation?   Exhibit 13-8   Violation?   V						V <sub>F</sub>			Exhibit 13-8	3		
Flow Entering Merge Influence Area    Actual   Max Desirable   Violation?   Actual   Max Desirable   Violation?   Exhibit 13-8   Violation?   Actual   Max Desirable   Violation?   Exhibit 13-8   Violation?   Violation?   Violation?   Violation?   Exhibit 13-8   Violation?   V	V	3516	Evhibit 13.8		No	$V_{EO} = V_{E}$	- V <sub>D</sub>		Exhibit 13-8	3		
Flow Entering Merge Influence Area  Actual Max Desirable Violation? $V_{R12}$ 3516 Exhibit 13-8 4600:All No $V_{12}$ Exhibit 13-8  Level of Service Determination (if not F) $D_R = 5.475 + 0.00734 \text{ V}_R + 0.0078 \text{ V}_{12} - 0.00627 \text{ L}_A$ $D_R = 27.6 \text{ (pc/mi/ln)}$ $D_R = 27.6 \text{ (pc/mi/ln)}$ $D_R = 0.378 \text{ (Exhibit 13-11)}$ $D_R = 0.378 \text{ (Exhibit 13-11)}$	*FO	3310	LAHIDIC 13-0		140				_			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$									10			
$V_{R12}$ 3516       Exhibit 13-8       4600:All       No $V_{12}$ Exhibit 13-8         Level of Service Determination (if not F)       Level of Service Determination (if not F) $D_R = 5.475 + 0.00734 \text{ v}_R + 0.0078 \text{ V}_{12} - 0.00627 \text{ L}_A$ $D_R = 4.252 + 0.0086 \text{ V}_{12} - 0.009 \text{ L}_D$ $D_R = 27.6 \text{ (pc/mi/ln)}$ $D_R = (\text{pc/mi/ln})$ $D_S = C \text{ (Exhibit 13-2)}$ $D_S = (\text{Exhibit 13-2})$ Speed Determination $D_S = (\text{Exhibit 13-12})$	low Enterin	ng Merge In	ifluence A	rea		Flow En	terin	g Diverg	ge Influen	ce Area	1	
Level of Service Determination (if not F)       Level of Service Determination (if not F) $D_R = 5.475 + 0.00734 \vee_R + 0.0078 \vee_{12} - 0.00627 \vee_A$ $D_R = 4.252 + 0.0086 \vee_{12} - 0.009 \vee_D$ $D_R = 27.6 \text{ (pc/mi/ln)}$ $D_R =  (pc/mi/$		Actual	Max	Desirable	Violation?		1	Actual	Max Desi	rable	Violation?	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	V <sub>R12</sub>	No	V <sub>12</sub>			Exhibit 13-8						
$D_{\rm R} = 27.6  ({\rm pc/mi/ln})$ $D_{\rm R} = ({$	evel of Ser	vice Detern	nination (	if not F)		Level of	f Serv	ice Det	erminatio	n (if not	<i>F</i> )	
	D <sub>R</sub> = 5.475	+ 0.00734 v <sub>R</sub> + 0	0.0078 V <sub>12</sub> - 0.0	00627 L <sub>A</sub>		` /						
CS = C  (Exhibit 13-2) $COS = C  (Exhibit 13-2)$	$O_{p} = 27.6  (pc/$	/mi/ln)				$D_p = (p)$	oc/mi/lı	1)		_		
Speed Determination  Speed Determination  D <sub>s</sub> = (Exhibit 13-12)		· ·						'				
$D_{\rm S} = 0.378 \text{ (Exhibit 13-11)}$ $D_{\rm S} = \text{ (Exhibit 13-12)}$		-							<u> </u>			
	-											
		· ·										
K 1 P V 1 P V	$S_{R} = 53.2 \text{ mpr}$							S <sub>R</sub> = mph (Exhibit 13-12)				
$_{0}$ = N/A mph (Exhibit 13-11) $S_{0}$ = mph (Exhibit 13-12)	<sub>0</sub> = N/A mph	N/A mph (Exhibit 13-11)										
s = 53.2 mph (Exhibit 13-13) S = mph (Exhibit 13-13)	53.2 mph	53.2 mph (Exhibit 13-13)						S = mph (Exhibit 13-13)				
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	RA	MPS AND	RAMP JUN	CTIONS W	/ORKSHI	EET			
General Info				Site Infor					
Analyst	AJR		Fr	eeway/Dir of Tr		I-526 WB			
Agency or Compan	y Atkin	S	Ju	nction		4270-WB Or	from Leeds		
Date Performed	7/25/	2014	Ju	risdiction					
analysis Time Perio			Ar	nalysis Year		2018 Build -	River Center Sit	е	
Project Description	Navy Base IC	ΓF							
nputs		1							
Jpstream Adj Ram	)	Freeway Numb	er of Lanes, N	2				Downst	ream Adj
		Ramp Number	of Lanes, N	1				Ramp	-
Yes O	n	Acceleration L	ane Length, L <sub>A</sub>	825				□Yes	On
✓ No 🗆 O	ff	Deceleration L	ane Length L <sub>n</sub>						_
¥110 🗀 O	11	Freeway Volur		3047				☑ No	Off
up = ft		Ramp Volume		696				L <sub>down</sub> =	ft
ap			Flow Speed, S <sub>FF</sub>	60.0					
$V_u = Veh/h$ Ramp Free-Flow Speed, $S_{FR}$ 45.0								$V_D =$	veh/h
<b>3</b> <i>i i</i>	4 //- 11		111	45.0					
Conversion	to pc/n Und	der Base (	onaitions	1	1	1			
(pc/h)	(Veh/hr)	PHF	Terrain	%Truck	%Rv	$f_{HV}$	f <sub>p</sub>	v = V/P	$HF \times f_{HV} \times f_{p}$
Freeway	3047	0.90	Level	9	0	0.957	1.00		3538
Ramp	696	0.90	Level	5	0	0.976	1.00		793
JpStream									
DownStream									
		Merge Areas					Diverge Are	eas	
Estimation of v <sub>12</sub>						ion of v <sub>1</sub>	2		
	V <sub>12</sub> = V <sub>F</sub>	(P <sub>FM</sub> )				V.	<sub>2</sub> = V <sub>R</sub> + (V <sub>F</sub>	- V <sub>R</sub> )P <sub>FD</sub>	
EQ =		L <sub>EQ</sub> =			13-12 or 13	3-13)			
P <sub>FM</sub> =		ation 13-6 or Jusing Equati	on (Exhibit 13-6)		P <sub>FD</sub> =			uation (Exhibi	
/ <sub>12</sub> =	3538		(=:::::::::::::::::::::::::::::::::::::		V <sub>12</sub> =		pc/h	zacio: (=x	,
12 1 <sub>3</sub> or V <sub>av34</sub>		•	3-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>		•	tion 13-14 or 1	3_17)
' <sub>3</sub> or V <sub>av34</sub>  s V <sub>3</sub> or V <sub>av34</sub> > 2,7			3-14-01-13-17)			> 2 700 pc	/h? Yes		5-17)
ls V <sub>3</sub> or V <sub>av34</sub> > 1.5			-16, 13-18, or				/2 Yes	ino ation 13-16	12 10 or
Yes,V <sub>12a</sub> =	13-19		-10, 13-10, 01		If Yes,V <sub>12a</sub> =	:	13-19)	ialion 13-10	, 13-10, 01
Capacity Ch		,			Capacit	v Check			
	Actual	C	apacity	LOS F?			tual	Capacity	LOS F?
					V <sub>F</sub>		Exhibi	t 13-8	
\/	4224	Evhibit 12.0		No	$V_{FO} = V_{F}$	- V <sub>D</sub>	Exhibi	t 13-8	
$V_{FO}$	4331	Exhibit 13-8		No		- R	Exhib		
					$V_R$		1		
low Enterin	g Merge In	fluence A	rea		Flow En	tering D	iverge Infl	uence Ar	ea
	Actual	Max [	Desirable	Violation?		Actua		Desirable	Violation?
$V_{R12}$	4331	Exhibit 13-8	4600:AII	No	V <sub>12</sub>		Exhibit 1	3-8	
evel of Service Determination (if not F)						Service	Determina	ation (if n	ot F)
	+ 0.00734 v <sub>R</sub> +				<b>Level of Service Determination (if not F)</b> $D_{R} = 4.252 + 0.0086 \ V_{12} - 0.009 \ L_{D}$				
$v_{\rm R} = 33.7  (pc/r)$	**	12	М		L	c/mi/ln)	12		
OS = D (Exhibi	•					Exhibit 13-2	)\		
					_		-		
Speed Deter		Speed Determination							
•	kibit 13-11)			$D_s = (Exhibit 13-12)$					
R= 50.2 mph	(Exhibit 13-11)			S <sub>R</sub> = mph (Exhibit 13-12)					
<sub>0</sub> = N/A mph		S <sub>0</sub> = mph (Exhibit 13-12)							
5 = 50.2 mph	(Exhibit 13-13)				S = mph (Exhibit 13-13)				
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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>I-526 W</i>	
Agency or Company	Atkins		From/To	4280-Le	eds to Paul
Date Performed	7/25/2014		Jurisdiction	Cantrell	
Analysis Time Period	AM Peak		Analysis Year	2018 Βι Site	ıild - River Center
Project Description Navy	Base ICTF			Onc	
✓ Oper.(LOS)			Des.(N)	Plar	nning Data
Flow Inputs		<u></u>			<u> </u>
Volume, V	3004	veh/h	Peak-Hour Factor, PHF	0.90	
AADT		veh/day	%Trucks and Buses, $P_T$	10	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments		·		
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$		
Speed Inputs			Calc Speed Adj and		
Lane Width		ft	Julio Opeca Auj alia i		
Rt-Side Lat. Clearance		ft			
Number of Lanes, N	2	11	f <sub>LW</sub>		mph
Total Ramp Density, TRD	2		$f_{LC}$		mph
	60.0	ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performanc	e Measures	5	Design (N)		
			Design (N)		
Operational (LOS)	_		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV 1752</sub>	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f	
x f <sub>p</sub> )		<b>P</b> 3	x f <sub>p</sub> )	HV	pc/h/ln
S	59.6	mph	S S		mph
D = v <sub>p</sub> / S	29.4	pc/mi/ln			pc/mi/ln
LOS	D		$D = v_p / S$ Required Number of Lanes	s N	рс/пп/п
Glossary			Factor Location	5, 14	
	C Cnor	- d	Factor Location		
N - Number of lanes	S - Spee		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
V - Hourly volume	D - Dens	•	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate		e-flow speed	f <sub>p</sub> - Page 11-18		TRD - Page 11-1
LOS - Level of service speed	BLL2 - B	ase free-flow	LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	
DDHV - Directional design	hour volume		11-3		
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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	4280-Le	eeds to Paul
Date Performed	7/25/2014		Jurisdiction	Cantrell	
Analysis Time Period	PM Peak		Analysis Year	2018 Bu Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plar	nning Data
Flow Inputs					
Volume, V	3743	veh/h	Peak-Hour Factor, PHF	0.90	
AADT		veh/day	%Trucks and Buses, P <sub>T</sub>	9	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length	Level mi	
DDHV - AADIXKXD		venin	Up/Down %	1111	
Calculate Flow Adjus	tments				
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	I)] <i>0.957</i>	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph		00.0	тірп
LOS and Performanc	·e Measures	· · · · · · · · · · · · · · · · · · ·	Design (N)		
	<u> </u>		Design (N)		
Operational (LOS)			Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV 2173</sub>	pc/h/ln	*	Nyf	
x f <sub>p</sub> )	2173	рс/п/п	$v_p = (V \text{ or DDHV}) / (PHF x)$	'N ^ 'HV	pc/h/ln
S	54.0	mph	x f <sub>p</sub> )		mnh
D = v <sub>p</sub> / S	40.2	pc/mi/ln	S D = v / S		mph
LOS	E		$D = v_p / S$ Required Number of Lanes	e NI	pc/mi/ln
Glossary			Factor Location	5, IN	
N - Number of lanes	S - Spee	<u>-</u>			
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>n</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18		TRD - Page 11-1
speed	2.10 00	200 1100 11011	LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	
DDHV - Directional design	hour volume		11-3		
	_			_	

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		RAMPS	S AND RAM	P JUNCTI	<u>on</u> s wo	RKS	HEET			
General Infor	rmation			Site Infor						
Analyst	AJR		Fr	eeway/Dir of Tr	avel	I-526 V	/B			
Agency or Company	/ Atkin	IS	Ju	ınction		4290-V	VB Off to P	aulCantrell WB		
Date Performed	7/25/	7/25/2014 Jurisdiction								
Analysis Time Perio	me Period AM Peak Analysis Year			nalysis Year		2018 B	uild - Rive	Center Site		
Project Description	ect Description Navy Base ICTF									
Inputs										
Upstream Adj F	Ramp	1 '	per of Lanes, N	2					Downstrea	am Adj
	7.	Ramp Number	amp Number of Lanes, N 1						Ramp	
□Yes	On	1	ane Length, L <sub>A</sub>						□Yes	On
✓ No	Off	Deceleration L		825					✓ No	Off
L <sub>up</sub> =	ft	Freeway Volune Ramp Volume		3004 1238					L <sub>down</sub> =	ft
ир		1	Flow Speed, S <sub>FF</sub>	60.0						
$V_u = V_v$	eh/h	Ramp Free-Flo		45.0					V <sub>D</sub> =	veh/h
Conversion t	to nc/h Uni		111	+0.0						
(pc/h)	V	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	f <sub>p</sub>	v = V/PHF	x f <sub>m</sub> , x f
,	(Veh/hr)			10	0	_		1.00		
Freeway	3004	0.90	Level	28	0	_	952			05
Ramp	1238	0.90	Level	20	U	0.	877	1.00	10	668
UpStream DownStream				1						
DownStream		Merge Areas						Diverge Areas		
stimation o		o.go /oao			Estimat	ion o		or go raioue		
		(D)						\(\(\ldot\) \(\ldot\) \(\ldot\)	\D	
	$V_{12} = V_{F}$							· V <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>		
- <sub>EQ</sub> =		ation 13-6 or			L <sub>EQ</sub> =		(	Equation 13-1	2 or 13-13	)
P <sub>FM</sub> =	using	Equation (E	xhibit 13-6)		$P_{FD} =$		1.	000 using Equ	uation (Exhi	bit 13-7)
/ <sub>12</sub> =	pc/h				V <sub>12</sub> =		3	505 pc/h		
/ <sub>3</sub> or V <sub>av34</sub>	pc/h (	Equation 13-	·14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>		0	pc/h (Equation	n 13-14 oi	13-17)
Is $V_3$ or $V_{av34} > 2,70$	-		,			., > 2.7		Yes ☑ No		,
Is $V_3$ or $V_{av34} > 1.5$								Yes ☑ No		
			-16, 13-18, or			•		c/h (Equation	13_16 13	-18 or 13
Yes,V <sub>12a</sub> =	13-19		10, 15-10, 01		If Yes,V <sub>12a</sub> =	=		9)	10-10, 10	-10, 01 13
Capacity Che	ecks				Capacit	y Ch	ecks	,		
, ,	Actual	Ca	apacity	LOS F?			Actual	Ca	pacity	LOS F
			· · ·		V <sub>F</sub>		3505	Exhibit 13-8	1	No
$V_{FO}$		Exhibit 13-8			V <sub>FO</sub> = V <sub>F</sub>	- V <sub>D</sub>	1937	Exhibit 13-8	4600	No
- FO		Extribit 10 0				K				
	14 1	<u> </u>			V <sub>R</sub>		1568	Exhibit 13-1		No
Flow Enterin	<del></del>			Violation?	Flow En			rge Influen Max Desirab		Violation
V <sub>R12</sub>	Actual	Exhibit 13-8	Desirable	v iOlatiUH !	V <sub>12</sub>	_	Actual 3505	Exhibit 13-8	4400:All	No
	rica Datarr	<u> </u>	f not []		+					
Level of Serv								termination		<u>r)</u>
$D_R = 5.475 + 0.00734 \text{ v}_R + 0.0078 \text{ V}_{12} - 0.00627 \text{ L}_A$							.0086 V <sub>12</sub> - 0.	009 L <sub>D</sub>		
					l .,		/mi/ln)			
LOS = (Exhibit 13-2)					-	<u> </u>	oit 13-2)			
Speed Determination				Speed L						
3 (					ľ	•	xhibit 13	,		
$S_R = mph (Ext)$	nibit 13-11)					2.1 mph	(Exhibit	13-12)		
K 1. /					In		/E	40.40\		
	nibit 13-11)				$S_0 = N$	/A mph	(Exhibit	13-12)		
$S_0 = mph (Ext)$	nibit 13-11) nibit 13-13)				l '		(Exhibit	*		

F-4081

General In	formation	10 (1011	S AND RAM	Site Infor						
Analyst	AJR		г.	reeway/Dir of Tr		I-526 V	V/D			
Agency or Comp				unction		4290-WB Off to PaulCantrell WB				
ate Performed				urisdiction		4230-V	VD OII to F	aulCaritieii WD		
nalysis Time Pe		Peak		nalysis Year	2018 Build - River Center Site					
	on Navy Base IC		7.0	naryolo roar		2010 0	dia Mivo	CONTON CITO		
nputs										
•	Upstream Adj Ramp Freeway Number of Lanes, N 2								Downstre	am Adi
·	_	Ramp Number	Ramp Number of Lanes, N 1						Ramp	amiraj
□Yes	□ On	Acceleration L	ane Length, L <sub>A</sub>						□Yes	On
✓ No	Off	Deceleration L	ane Length L <sub>D</sub>	825					✓No	Off
_	_	Freeway Volui	ne, V <sub>F</sub>	3743						
L <sub>up</sub> =	ft	Ramp Volume	, V <sub>R</sub>	1987					L <sub>down</sub> =	ft
V,, =	veh/h		-Flow Speed, $S_{\rm FF}$	60.0					V <sub>D</sub> =	veh/h
v <sub>u</sub> –	venin	Ramp Free-Flo	ow Speed, S <sub>FR</sub>	45.0					- D	
onversio	n to pc/h Un	der Base (	Conditions							
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	fp	v = V/PHI	x f <sub>HV</sub> x f <sub>p</sub>
reeway	3743	0.90	Level	9	0	0.	957	1.00	4	346
Ramp	1987	0.90	Level	15	0	$\overline{}$	930	1.00		373
JpStream										
DownStream										
		Merge Areas						Diverge Areas		
stimation	of v <sub>12</sub>				Estimat	ion o	of v <sub>12</sub>			
	V <sub>12</sub> = V <sub>F</sub>	(P <sub>FM</sub> )					V <sub>12</sub> =	· V <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>	P <sub>FD</sub>	
EQ =	(Equ	ation 13-6 or	13-7)		L <sub>EQ</sub> =			Equation 13-1	–	3)
FM =		Equation (E			P <sub>FD</sub> =			000 using Equ		
12 =	pc/h	, , ,	,		V <sub>12</sub> =			346 pc/h		
or V <sub>av34</sub>	•	(Equation 13-	.14 or 13 <sub>-</sub> 17)		V <sub>3</sub> or V <sub>av34</sub>			pc/h (Equatio	n 13 <sub>-</sub> 14 c	r 13 <sub>-</sub> 17)
	2,700 pc/h? ☐ Ye		14 01 10 17)			> 2 7		Yes ☑ No	/// 13-1 <del>-</del> C	113-17)
	1.5 * V <sub>12</sub> /2							Yes ✓ No		
0 0,01			-16, 13-18, or						13_16_13	R-18 or 13
Yes,V <sub>12a</sub> =	13-19	: •	10, 13-10, 01		lf Yes,V <sub>12a</sub> = pc/h (Equation 13-16, 13-18, or 13-19)					
Capacity C	hecks	,			Capacit	y Ch	ecks	,		
	Actual	C	apacity	LOS F?			Actual	Ca	pacity	LOS F
					V <sub>F</sub>		4346	Exhibit 13-8	4600	No
$V_{FO}$		Exhibit 13-8			V <sub>FO</sub> = V <sub>F</sub>	- V <sub>D</sub>	1973	Exhibit 13-8	4600	No
10					V <sub>R</sub>	- IX	2373	Exhibit 13-1		Yes
low Entor	ring Merge II	nfluonoo A	roo			torin		rge Influen		
TOW LINE	Actual		Desirable	Violation?	FIOW EI	_	Actual	Max Desirab		Violation
V <sub>R12</sub>	/ totudi	Exhibit 13-8	200110010	v iolation:	V <sub>12</sub>	_	1346	Exhibit 13-8	4400:All	No
	ervice Deteri		f not E		<del>                                     </del>			terminatio		
									•	<u>r)</u>
	+ 0.00734 v <sub>R</sub> +	0.0078 V <sub>12</sub> -	0.00627 L <sub>A</sub>					.0086 V <sub>12</sub> - 0.	009 L <sub>D</sub>	
D <sub>R</sub> = (pc/mi/ln)					l ''		/mi/ln)			
LOS = (Exhibit 13-2)						<u> </u>	oit 13-2)			
Speed Determination					Speed L	Deter	minatio	on		
M <sub>S</sub> = (Exibit 13-11)					$D_s = 0.$	512 (E	xhibit 13	-12)		
					S <sub>R</sub> = 50	0.8 mph	(Exhibit	13-12)		
	EXHIDIT 13-11)									
R= mph (	Exhibit 13-11) Exhibit 13-11)				1	/A mph	(Exhibit	13-12)		
$_{\rm R}^{=}$ mph ( $_{\rm 0}^{=}$ mph ( $_{\rm 0}^{=}$	Exhibit 13-11) Exhibit 13-11) Exhibit 13-13)				$S_0 = N$	-	(Exhibit (Exhibit	-		

	RAMP	S AND RAI	/P JUNCTI	ONS WO	RKS	HEET				
mation		- / IV-III				· · ·				
AJR Atkins		J	reeway/Dir of Tra Junction				aulCantrell EB			
11-11-11					2018 B	uild - River	Center Site			
			. ,							
amp	1					Downstrea Ramp	am Adj			
On	l '	•						l '	On	
Off			525					✓No	Off	
		'	1766 665					L <sub>down</sub> =	ft	
			60.0					\/_ =	veh/h	
en/n	Ramp Free-Fl	ow Speed, S <sub>FR</sub>	25.0					V D -	VCII/II	
	ler Base	Conditions								
V (Veh/hr)	PHF	Terrain	%Truck	%Rv		$f_{HV}$	f <sub>p</sub>	v = V/PHF	$x f_{HV} x f_{p}$	
1766	0.90	Level	10	0	_		1.00		60	
665	0.90	Level	5	0	0.	976	1.00	7:	57	
					_					
1	l <u> </u>						iverge Areas			
				Estimat	tion o	f v <sub>12</sub>				
	(P)						V <sub>2</sub> + (V <sub>2</sub> - V <sub>3</sub>	_)P		
		13-7)		L <sub>-0</sub> =				–	)	
_	1 (	,								
	Equation 13	-14 or 13-17)					•	on 13-14 or	13-17)	
	-	,			,31 > 2,7				- ,	
	Equation 13	-16, 13-18, or		If Yes,V <sub>12a</sub> = pc/h (Equation 13-16, 13-18, or 13-19)						
cks				Capacity Checks						
Actual	C	apacity	LOS F?			Actual	Ca	pacity	LOS F?	
						2060			No	
	Exhibit 13-8					1303			No	
						757			No	
	·		1 1 1 1 2	Flow E	_		<del></del>		1	
Actual		Desirable	Violation?	V.o	$\neg$				Violation?	
ice Detern		if not F)								
								_	<i>' )</i>	
$D_{R} = 0.476 + 0.00764 + 0.0076 + 0.0027 + 0.00027 + $							12	_Б		
LOS = (Exhibit 13-2)										
Speed Determination					<u> </u>					
•					-					
					-	•				
,				1	-	•	-			
S = mph (Exhibit 13-13)  Copyright © 2012 University of Florida, All Rights Reserved  HO							13-13)			
	Atkins 7/25/2 AM P  Navy Base ICT  amp  On  Off  eh/h  pc/h Unc  V (Veh/hr)  1766 665  V12  V12 = V <sub>F</sub> (Equa using pc/h pc/h (I 13-19)  cks  Actual  Actual  ice Detern  00734 V R + (1) 13-2)  inination  3-11) ibit 13-11) ibit 13-11)	AJR Atkins 7/25/2014 AM Peak Navy Base ICTF  AMPeak Navy Base ICTF  ACCELERATION L CONTROL CON	AJR Atkins 7/25/2014 AM Peak  Navy Base ICTF  AMPeak  Namp Number of Lanes, N Ramp Number of Lanes, N Ramp Number of Lanes, N Acceleration Lane Length, L Preeway Volume, V Ramp Volume, V Ramp Volume, V Remy Free-Flow Speed, S Ramp Volume, V Ramp Volume	### Atkins	Alkins	### Atkins	AJR Atkins Junction 4300-WB Off to Pt Atkins 7/25/2014 Jurisdiction AM Peak Analysis Year 2018 Build - River Navy Base ICTF  amp   Freeway Number of Lanes, N   2   2   2   2   2   2   2   2   2	Aurition	### AJR   FreewayDir of Travel   1-526 WB   AJKins   Junction   4300-WB Off to Paul Cantrell EB   Junction   4300-WB Off to Paul Cantrell   4300-WB Off to Paul	

		RAMP	S AND RAM	P JUNCTI	ONS WO	RKS	HEET						
General Info	rmation			Site Infor									
Analyst	AJR		Fr	eeway/Dir of Tr	avel	I-526 V	/B						
Agency or Company	y Atkin	ıs	Ju	ınction		4300-V	/B Off to P	aulCantrell EB					
Date Performed	7/25/	7/25/2014 Jurisdiction											
Analysis Time Perio	e Period PM Peak Analysis Year			nalysis Year		2018 B	uild - Rive	Center Site					
Project Description	ct Description Navy Base ICTF												
nputs													
Upstream Adj F	Ramp	1 1	ber of Lanes, N	2					Downstrea	am Adj			
		Ramp Number	amp Number of Lanes, N 1						Ramp				
□Yes	On	1	ane Length, L <sub>A</sub>						□Yes	On			
✓ No	Off	Freeway Volui	ane Length L <sub>D</sub>	525 1756					<b>☑</b> No	Off			
L <sub>up</sub> =	ft	Ramp Volume		708					L <sub>down</sub> =	ft			
		Freeway Free	Flow Speed, S <sub>FF</sub>	60.0					\	1- //-			
$V_u = V_u$	/eh/h	1	ow Speed, S <sub>ER</sub>	25.0					V <sub>D</sub> =	veh/h			
Conversion t	to pc/h Un	der Base (	Conditions										
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	fp	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>			
Freeway	1756	0.90	Level	9	0	0.	957	1.00	20	39			
Ramp	708	0.90	Level	4	0		980	1.00		02			
UpStream		1 1											
DownStream													
		Merge Areas						Diverge Areas					
Estimation o	f v <sub>12</sub>				Estimat	ion o	f v <sub>12</sub>						
	V <sub>12</sub> = V <sub>F</sub>	( P.,, )					V.0 =	V <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>	)P_p				
=		ation 13-6 or	12 7)					Equation 13-1		\			
-EQ =					L <sub>EQ</sub> =			-					
P <sub>FM</sub> =	_	Equation (E	exhibit 13-6)		P <sub>FD</sub> =			000 using Equ	uation (Exhi	bit 13-7)			
/ <sub>12</sub> =	pc/h				V <sub>12</sub> =			039 pc/h					
$V_3$ or $V_{av34}$	pc/h (	Equation 13	-14 or 13-17)		$V_3$ or $V_{av34}$		0	pc/h (Equation	n 13-14 or	13-17)			
Is $V_3$ or $V_{av34} > 2,7$	00 pc/h?	s 🗌 No			Is V <sub>3</sub> or V <sub>av</sub>	<sub>34</sub> > 2,7	00 pc/h? [	☐ Yes ☑ No					
Is V <sub>3</sub> or V <sub>av34</sub> > 1.5	* V <sub>12</sub> /2 ☐ Ye	s 🗆 No			Is V <sub>3</sub> or V <sub>av</sub>	<sub>34</sub> > 1.5	* V <sub>12</sub> /2	☐Yes ☑ No					
			-16, 13-18, or					c/h (Equation	13-16, 13-	-18, or 13			
Yes,V <sub>12a</sub> =	13-19				If Yes,V <sub>12a</sub> =		<u>1</u>	9) ` '		,			
Capacity Ch	ecks				Capacit	y Ch	ecks						
	Actual	C	apacity	LOS F?			Actual	Ca	pacity	LOS F			
					V <sub>F</sub>		2039	Exhibit 13-8	4600	No			
$V_{FO}$		Exhibit 13-8			V <sub>FO</sub> = V <sub>F</sub>	V <sub>D</sub>	1237	Exhibit 13-8	4600	No			
FO						· K	802	Exhibit 13-1		No			
		- fl A			V <sub>R</sub>	. 4				INO			
Flow Enterin	7			Violation?	FIOW EI	_		rge Influen Max Desirab		Violation			
	Actual		Desirable	violation?	\/	_	Actual	Exhibit 13-8					
V <sub>R12</sub>		Exhibit 13-8			V <sub>12</sub>		2039		4400:All	No No			
Level of Service Determination (if not F)								termination		F)			
$D_R = 5.475 + 0.00734 \text{ v}_R + 0.0078 \text{ V}_{12} - 0.00627 \text{ L}_A$					D <sub>R</sub> = 17	$D_R = 4$	.252 + 0	.0086 V <sub>12</sub> - 0.	009 L <sub>D</sub>				
$D_R = 5.475 + 0$	D <sub>R</sub> = (pc/mi/ln)					7.1 (pc	mi/ln)						
	LOS = (Exhibit 13-2)					(Exhib	oit 13-2)						
) <sub>R</sub> = (pc/mi/lr	13-2)		Speed Determination				minatio	LOS = B (Exhibit 13-2)  Speed Determination					
$D_R = (pc/mi/lr$ LOS = (Exhibit)					<u> </u>								
O <sub>R</sub> = (pc/mi/lr OS = (Exhibit Speed Deter	mination						xhibit 13						
$O_R = (pc/mi/lr)$ OS = (Exhibit) OS = (Exhibit) OS = (Exhibit) OS = (Exhibit)	<b>mination</b>				$D_s = 0.$	.630 (E		-12)					
$D_R = (pc/mi/lr)$ $D_R = (pc/mi/lr)$ $D_R = (Exhibit)$ $D_R = (E$	mination 13-11) hibit 13-11)				$D_s = 0.$ $S_R = 48$	.630 (E 8.7 mph	(Exhibit	-12) 13-12)					
$D_{R}$ = (pc/mi/li $D_{R}$ = (Exhibit) <b>Speed Detern</b> $M_{S}$ = (Exibit 1) $D_{R}$ = mph (Exhibit) $D_{R}$ = mph (Exhibit)	<b>mination</b>				$D_{s} = 0.$ $S_{R} = 48$ $S_{0} = N_{s}$	.630 (E 8.7 mph /A mph		-12) 13-12) 13-12)					

F-4084

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	T	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	u <i>I-526 W</i>	/B
Agency or Company	Atkins		From/To	4305-Pa	auICEB Off to
Date Performed	4/25/2014		Jurisdiction	PaulCE	B On
Analysis Time Period	AM Peak		Analysis Year	2018 Bu Site	uild - River Center
Project Description Navy	Base ICTF			Sile	
✓ Oper.(LOS)			Pes.(N)	Plar	nning Data
Flow Inputs					3
Volume, V	1101	veh/h	Peak-Hour Factor, PHF	0.90	
AADT		veh/day	%Trucks and Buses, $P_T$	10	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length	mi	
Oala lata Ela Aulta	1 1 -		Up/Down %		
Calculate Flow Adjus					
$f_p$	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] <i>0.952</i>	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	•
Base free-flow Speed,		•	14.2	60.0	mph
BFFS		mph			
LOS and Performanc	e Measures	<u> </u>	Design (N)		
Operational (LOS)			Design (N)		
Operational (LOS)	NI v f		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x)$	1N X 1 <sub>HV</sub> 642	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	
x f <sub>p</sub> )	00.0		x f <sub>p</sub> )		pc/h/ln
5	60.0	mph	s		mph
$D = v_p / S$	10.7	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	Α		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spec	ed			f Eubibit 44.0
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>n</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18	44.0	TRD - Page 11-11
speed			LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	
DDHV - Directional design	hour volume		11-3		
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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	T	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>I-526 W</i>	
Agency or Company	Atkins		From/To	4305-Pa	auICEB Off to
Date Performed	7/25/2014		Jurisdiction	PaulCE	B On
Analysis Time Period	PM Peak		Analysis Year	2018 Βι Site	ıild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Pes.(N)	Plar	nning Data
Flow Inputs					
Volume, V	1048	veh/h	Peak-Hour Factor, PHF	0.90	
AADT		veh/day	%Trucks and Buses, $P_T$	9	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D		and the Ma	General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tmonte		Op/Down 70		
				1.2	
f <sub>p</sub>	1.00		E <sub>R</sub>		
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$		
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		$f_{LC}$		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed,		mph			
BFFS	- Magaurat	<u> </u>	Design (N)		
LOS and Performanc	e weasures	<u> </u>	Design (N)		
Operational (LOS)			Design (N)		
$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>		Design LOS		
x f <sub>p</sub> )	'' <sup>v</sup> 608	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x t <sub>HV</sub>	pc/h/ln
S	60.0	mph	x f <sub>p</sub> )		·
D = v <sub>p</sub> / S	10.1	pc/mi/ln	S		mph
LOS	A	<b>P</b> 3	$D = v_p / S$		pc/mi/ln
			Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed	E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens	sity	$E_{\rm T}$ - Exhibits 11-10, 11-11,		f <sub>LC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate	FFS - Free	e-flow speed	$f_{\rm n}$ - Page 11-18		TRD - Page 11-11
LOS - Level of service	BFFS - Ba	ase free-flow	LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2	IND - Lage 11-11
speed DDHV - Directional design	hour volume		11-3		
	da All Pights Pese				sted: 12/0/2014 10:32 AN

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	RA	MPS AND	RAMP JUNG	CTIONS W	/ORKSHI	EET					
General Info		J. 1119		Site Infor		<del></del> -					
Analyst	AJR		Fr	eeway/Dir of Ti		I-526 WB					
Agency or Compan	y Atkin	S	Ju	nction		4310-WB On from PaulCantrellEB					
Date Performed	4/25/	2014		risdiction							
Analysis Time Perio	<del>-</del> <del>-</del>			nalysis Year		2018 Build - R	River Center Site				
roject Description Navy Base ICTF											
nputs		1						ı			
Jpstream Adj Ram	р	1	er of Lanes, N	2				Downsti	eam Adj		
		Ramp Number	amp Number of Lanes, N 1					Ramp			
Yes C	)n	Acceleration L	ane Length, L <sub>A</sub>	700				□Yes	On		
✓ No 🗆 C	off	Deceleration L	ane Length L <sub>D</sub>						_		
<u>. 140                                   </u>	/II	Freeway Volur	ne, V <sub>E</sub>	1101				✓ No	Off		
<sub>up</sub> = ft		Ramp Volume		268				L <sub>down</sub> =	ft		
			Flow Speed, S <sub>FF</sub>	60.0				L.			
$t_{\rm u} = {\rm veh}/{\rm veh}$	'h	Ramp Free-Flo		45.0				$V_D =$	veh/h		
2	40 00 0/10 11:0		111	45.0							
Conversion	to pc/n Uno		onaitions	1	1	1					
(pc/h)	(Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	f <sub>p</sub>	v = V/Pl	$HF \times f_{HV} \times f_{p}$		
Freeway	1101	0.90	Level	10	0	0.952	1.00		1285		
Ramp	268	0.90	Level	7	0	0.966	1.00		308		
JpStream											
DownStream											
Merge Areas					<u> </u>		Diverge Area	as			
stimation o	of v <sub>12</sub>				Estimati	ion of v <sub>12</sub>					
	V <sub>12</sub> = V <sub>F</sub>	(P <sub>FM</sub> )				V <sub>12</sub>	= V <sub>R</sub> + (V <sub>F</sub> -	V <sub>R</sub> )P <sub>FD</sub>			
EQ =		ation 13-6 or	13-7)		L <sub>EQ</sub> =	12		13-12 or 13	-13)		
P <sub>FM</sub> =			on (Exhibit 13-6)		P <sub>FD</sub> =			ation (Exhibit			
' <sub>12</sub> =	1285		(=		V <sub>12</sub> =		pc/h	z (=/	,		
<sup>12</sup> <sup>1</sup> or V <sub>av34</sub>		•	3-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>		•	on 13-14 or 13	₹_17\		
' <sub>3</sub>			3-14-01-13-17)			> 2 700 pc/k	PC/II (Equation 1? ☐ Yes ☐ I		-11)		
ls V <sub>3</sub> or V <sub>av34</sub> > 1.5			-16, 13-18, or		1		Yes I	No ition 13-16,	12 10 or		
Yes,V <sub>12a</sub> =	13-19		-10, 13-10, 01		If Yes,V <sub>12a</sub> =		13-19)	111011 13-10,	13-10, 01		
Capacity Ch		,			Capacit	y Checks					
	Actual	C	apacity	LOS F?		Act		Capacity	LOS F?		
					V <sub>F</sub>		Exhibit	13-8			
\/	1593	Evhibit 12.0		No	$V_{FO} = V_{F}$	- V <sub>D</sub>	Exhibit	13-8			
$V_{FO}$	1595	Exhibit 13-8		INO		R	Exhibit				
					V <sub>R</sub>		10				
low Enterin	ng Merge In	fluence A	rea		Flow En	tering Di	verge Influ	ence Are	а		
	Actual	Max [	Desirable	Violation?		Actual		Desirable	Violation?		
V <sub>R12</sub>	1593	Exhibit 13-8	4600:AII	No	V <sub>12</sub>		Exhibit 13-	-8			
evel of Ser	vice Deterr	nination (i	f not F)			Service	Determina	tion (if no	ot F)		
$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$									•		
) <sub>R</sub> = 13.4 (pc/	$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$										
LOS = B (Exhibit 13-2)						D <sub>R</sub> = (pc/mi/ln) LOS = (Exhibit 13-2)					
· · ·											
-					<del>                                     </del>	<u>Determina</u>	เนอก				
$M_{\rm S} = 0.277  (E)$	xibit 13-11)				l °	xhibit 13-12)					
$S_{R} = 55.0 \text{ mph}$	(Exhibit 13-11)				S <sub>R</sub> = m <sub>l</sub>	ph (Exhibit 13-	-12)				
	(Exhibit 13-11)				$S_0 = m_1$	ph (Exhibit 13-	-12)				
5= 55.0 mph	(Exhibit 13-13)				ls = m	nh (Exhibit 13-	-13)				
- 33.0 mpi	(				S = mph (Exhibit 13-13)						

	RA	MPS AND	RAMP JUNG	CTIONS W	ORKSHE	ET						
General Info		371119		Site Infor		<del>-</del> -						
Analyst	AJR		Fre	eeway/Dir of Ti		l-526 WB						
Agency or Compa	ny Atkir	ns	Ju	nction	4	4310-WB On from PaulCantrellEB						
Date Performed		/2014		risdiction								
Analysis Time Per	<del>-</del>					2018 Build - Rive	er Center Site					
	n Navy Base IC	TF										
nputs		le										
Jpstream Adj Rar	np	1	per of Lanes, N	2				Downstre	am Adj			
	0	1 '	Ramp Number of Lanes, N 1					Ramp				
Yes 🗆	On .	Acceleration La	ane Length, L <sub>A</sub>	700				□Yes	On			
✓ No	Off	Deceleration L	ane Length L <sub>D</sub>					☑No	Off			
		Freeway Volur	ne, V <sub>F</sub>	1048				I INO				
<sub>rup</sub> = ft		Ramp Volume	V <sub>R</sub>	215				L <sub>down</sub> =	ft			
			Flow Speed, S <sub>FF</sub>	60.0				, _	l. /l.			
$l_{\rm u} = {\rm veh}$	n/h	Ramp Free-Flo		45.0				V <sub>D</sub> =	veh/h			
Conversion	to pc/h Un		111	10.0								
	V			0/ T	0/ D			V/DIII				
(pc/h)	(Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	f <sub>p</sub>	V = V/PH	F x f <sub>HV</sub> x f <sub>p</sub>			
Freeway	1048	0.90	Level	9	0	0.957	1.00		1217			
Ramp	215	0.90	Level	7	0	0.966	1.00		247			
JpStream												
DownStream		Marria Arasa			-		Diverse Areas					
stimation	of v	Merge Areas			Fetimati	on of v <sub>12</sub>	Diverge Areas					
- Sumation					LStillati							
	$V_{12} = V_{F}$						$V_R + (V_F - V_R)$					
EQ =	(Equ	ation 13-6 or	13-7)		L <sub>EQ</sub> =		(Equation 13-	12 or 13-1	13)			
P <sub>FM</sub> =	1.000	using Equati	on (Exhibit 13-6)		P <sub>FD</sub> =		using Equation	n (Exhibit 1	3-7)			
′ <sub>12</sub> =	1217	pc/h			V <sub>12</sub> =		pc/h					
<sub>3</sub> or V <sub>av34</sub>	0 pc/	h (Equation 1	3-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>		pc/h (Equation 1	13-14 or 13-	17)			
ls V <sub>3</sub> or V <sub>av34</sub> > 2	,700 pc/h? 🗌 Ye	es 🗹 No			Is V <sub>3</sub> or V <sub>av3</sub>	4 > 2,700 pc/h?	☐Yes ☐ No					
Is $V_3$ or $V_{av34} > 1$	.5 * V <sub>12</sub> /2 □ Ye	es 🗹 No			Is V <sub>3</sub> or V <sub>av3</sub>	<sub>4</sub> > 1.5 * V <sub>12</sub> /2	☐Yes ☐ No					
Yes,V <sub>12a</sub> =			-16, 13-18, or		If Yes,V <sub>12a</sub> =		pc/h (Equatio	n 13-16, 1	3-18, or			
	13-19	)			Capacity Checks							
Capacity Cl				1	Capacity				1			
	Actual	Ca	apacity	LOS F?	<del>  ,,</del>	Actual		pacity	LOS F?			
					V <sub>F</sub>		Exhibit 13-	_				
$V_{FO}$	1464	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>	Exhibit 13-	8				
					V <sub>R</sub>		Exhibit 13	-				
Tour Entori	na Maraa I	ofluoroo A			**	torina Dive	10					
-iow Enteri	ng Merge Ir Actual	*	rea Desirable	Violation?	FIOW En	Actual	erge Influer		Violation?			
V <sub>R12</sub>	1464	Exhibit 13-8	4600:All	No	V <sub>12</sub>	Actual	Exhibit 13-8	lable	Violations			
	-			NO		Sanciae De	eterminatio	n (if not				
<b>Level of Service Determination (if not F)</b> $D_{R} = 5.475 + 0.00734 \text{ v}_{R} + 0.0078 \text{ V}_{12} - 0.00627 \text{ L}_{A}$								<u> </u>	<i>F)</i>			
		$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$										
D <sub>R</sub> = 12.4 (pc/mi/ln)						$D_R = (pc/mi/ln)$						
LOS = B (Exhibit 13-2)						LOS = (Exhibit 13-2)						
•	Speed Determination					eterminati	on					
•							D <sub>s</sub> = (Exhibit 13-12)					
Speed Dete		3 ' '						l .				
<b>Speed Dete</b> 1 <sub>S</sub> = 0.275 (I	Exibit 13-11)					•	)					
<b>Speed Dete</b> $M_S = 0.275 (I)$ $M_R = 55.1 \text{ mp}$	Exibit 13-11) oh (Exhibit 13-11)				S <sub>R</sub> = mp	•	<u>-</u>					
Speed Dete $M_{\rm S} = 0.275 \text{ (II)}$ $G_{\rm R} = 55.1 \text{ mp}$ $G_{\rm O} = \text{N/A mp}$	Exibit 13-11)				$S_R = mp$ $S_0 = mp$	oh (Exhibit 13-12	)					

# Appendix E Traffic Analysis Worksheets

2018 Opening Year
Build River Center Site Alternatives 5-7
US Highway 17

## **MAJOR MERGE SEGMENTS ANALYSIS**

## **ATKINS**

#### General Information

Date Performed: Analysis Year 7/25/2014 2018 Build-River Center Site AM Peak Freeway/Direction Junction Segment ID US 17 NB From I-26 EB & WB 5010

Analysis Time Period: Project Description:

Navy Base ICTF

#### Inputs

	Freeway Upstream of On-Ramp	Freeway Downstream of On-Ramp	On-Ramp
Number of Lanes, N	2	4	2
Free-Flow Speed, FFS (mph)	55	55	55
Volume, V (veh/h)	1,782	3,088	1,306
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	2%	2%	2%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Freeway Upstream of On-Ramp	Freeway Downstream of On-Ramp	On-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.99	0.99	0.99
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	1,000	866	733
Capacity Flow Rate, c (pc/h/ln)	2,250	2,250	2,200
v/c ratio	0.44	0.38	0.33
	Below Capacity	Below Capacity	Below Capacity

#### Formulas and Reference Material

$$f_{HV} = \frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$
 HCM 2010, Equation 11-3  
 $V_p = \frac{V}{PHF^*N^*f_{HV}^*f_P}$  HCM 2010, Equation 11-2

Basic Freeway Segments Max Service Flow Rates

	9
FFS (mi/h)	Capacity (pc/h/ln)
75	2,400
70	2,400
65	2,350
60	2,300
55	2,250

Source: HCM 2010, Exhibit 11-17

#### Ramp Roadways Max Service Flow Rates

ramp reductage max correct rem rates		
FFS (mi/h)	Capacity (pc/h/ln)	
> 50	2,200	
>40-50	2,100	
>30-40	2,000	
≥20-30	1,900	
<20	1,800	

Source: HCM 2010, Exhibit 13-10

### **MAJOR MERGE SEGMENTS ANALYSIS**

# **ATKINS**

#### General Information

Date Performed: Analysis Year 7/25/2014 2018 Build-River Center Site

PM Peak

Freeway/Direction
Junction
Segment ID

US 17 NB From I-26 EB & WB 5010

Analysis Time Period: Project Description:

Navy Base ICTF

#### Inputs

	Freeway Upstream of On-Ramp	Freeway Downstream of On-Ramp	On-Ramp
Number of Lanes, N	2	4	2
Free-Flow Speed, FFS (mph)	55	55	55
Volume, V (veh/h)	2,040	2,716	676
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	2%	2%	3%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Freeway Upstream of On-Ramp	Freeway Downstream of On-Ramp	On-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.99	0.99	0.99
Demand Flow Rate, $v_p$ (pc/h/ln)	1,145	762	381
Capacity Flow Rate, c (pc/h/ln)	2,250	2,250	2,200
v/c ratio	0.51	0.34	0.17
	Below Capacity	Below Capacity	Below Capacity

#### Formulas and Reference Material

$$f_{HV} = \frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$
 HCM 2010, Equation 11-3  
 $V_p = \frac{V}{PHF^*N^*f_{HV}^*f_P}$  HCM 2010, Equation 11-2

Basic Freeway Segments Max Service Flow Rates

,		
FFS (mi/h)	Capacity (pc/h/ln)	
75	2,400	
70	2,400	
65	2,350	
60	2,300	
55	2,250	

Source: HCM 2010, Exhibit 11-17

#### Ramp Roadways Max Service Flow Rates

ramp reductage max correct rem reason		
FFS (mi/h)	Capacity (pc/h/ln)	
> 50	2,200	
>40-50	2,100	
>30-40	2,000	
≥20-30	1,900	
<20	1,800	

Source: HCM 2010, Exhibit 13-10

		RAI	MPS AND	RAMP JUN	CTIONS W	ORKSHI	EET				
Genera	I Infor		5 , 1115		Site Infor						
Analyst		AJR		Fr	eeway/Dir of Tr		US-17	7 NB			
Agency or (	Company	Atkins	S		inction			NB On from	Meeting		
Date Perfor	rmed	7/25/2	2014		ırisdiction						
Analysis Tir				Ar	nalysis Year		2018	Build - River	Center Site		
	scription	Navy Base ICT	F								
Inputs			L							1	
Upstream A	Adj Ramp		l '	ber of Lanes, N	4					Downstre	am Adj
			Ramp Numbe	r of Lanes, N	1					Ramp	
Yes	On		Acceleration L	ane Length, L <sub>A</sub>	1125					□Yes	On
☑ No	Off	:	Deceleration I	Lane Length L <sub>D</sub>						✓ No	Off
			Freeway Volu	me, V <sub>F</sub>	3088					INO	
_ <sub>up</sub> =	ft		Ramp Volume	e, V <sub>R</sub>	460					L <sub>down</sub> =	ft
				-Flow Speed, S <sub>FF</sub>	55.0						la //a
/ <sub>u</sub> =	veh/h		1	low Speed, S <sub>FR</sub>	45.0					V <sub>D</sub> =	veh/h
Conver	sion to			Conditions							
		<i>γ</i> γ γ γ γ γ γ γ γ γ γ γ γ γ γ γ γ γ γ			0/ T	0/ 5		<u>,</u>	£	\//D! !!	- ,, , ,, ,
(pc/	n)	(Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	f <sub>p</sub>	v = V/PHI	x f <sub>HV</sub> x f <sub>p</sub>
Freeway		3088	0.90	Level	2	0	(	).990	1.00	;	3465
Ramp		460	0.90	Level	10	0		).952	1.00		537
UpStream							_				
DownStrea	am		Manna Anaga						\: A		
Estima	tion of		Merge Areas			Estimati	ion		Diverge Areas		
_Suma	uon oi					LSuman	011	01 V <sub>12</sub>			
		$V_{12} = V_{F}$	(P <sub>FM</sub> )					V <sub>12</sub> = '	V <sub>R</sub> + (V <sub>F</sub> - V <sub>R</sub>	)P <sub>ED</sub>	
L <sub>EQ</sub> = (Equation 13-6 or 13-7)				L <sub>EQ</sub> =			Equation 13-		3)		
P <sub>FM</sub> =		0.151	using Equat	ing Equation (Exhibit 13-6) $P_{FD} =$ using Equation (Exhi							
/ <sub>12</sub> =		522 p	c/h			$V_{12}$ = pc/h					
V <sub>3</sub> or V <sub>av34</sub>			oc/h (Equati	on 13-14 or 13-		V <sub>3</sub> or V <sub>av34</sub>			pc/h (Equation 1	13_14 or 13_1	17)
	0.70	17)	_				> 2		Yes □No		''')
		0 pc/h? TYes									
Is V <sub>3</sub> or V <sub>a</sub>	<sub>v34</sub> > 1.5 *	V <sub>12</sub> /2							∃Yes ⊟No oc/h (Equatio	n 13-16 1	3-18 or
f Yes,V <sub>12a</sub>	=	1386 դ 18, or		on 13-16, 13-		If Yes,V <sub>12a</sub> =	:		3-19)	11 10-10, 1	J-10, 01
Capaci	ty Che	<u> </u>	13-13)			Capacity	v Ch	necks			
оприот	ty One	Actual	1 0	Capacity	LOS F?	Jupatin	, 0.	Actual	Car	pacity	LOS F?
		7 totaar		- Apacity	2001:	V <sub>F</sub>		7101001	Exhibit 13-		2001:
.,					l	$V_{FO} = V_{F}$	- \/		Exhibit 13-	_	+
$V_{F}$	0	4002	Exhibit 13-8		No		- <b>v</b> <sub>R</sub>		Exhibit 13	_	+
						$V_R$			10	-	
Flow E	nterino	Merge In	fluence A	rea	<u>'</u>	Flow En	terii	na Dive	rge Influen	ice Area	
		Actual	1	Desirable	Violation?			Actual	Max Des		Violation?
V <sub>R1</sub>	12	1923	Exhibit 13-8	4600:AII	No	V <sub>12</sub>			Exhibit 13-8		
		ice Detern	nination (	if not F)			Ser	vice De	terminatio	n (if not	F)
		0.00734 v <sub>R</sub> + 0	•						.0086 V <sub>12</sub> - 0		
	3.2 (pc/m		12	^			c/mi/		14	D	
11								it 13-2)			
LOS = B (Exhibit 13-2)  Speed Determination			Speed D			n e					
_						1-1			<i>// /</i>		
•	).246 (Exit					1 "		13-12)			
11		Exhibit 13-11)						(hibit 13-12)			
0		Exhibit 13-11)				$S_0 = m_1$	ph (Ex	(hibit 13-12)			
S = 5	52.4 mph (	Exhibit 13-13)				S = m <sub>l</sub>	ph (Ex	thibit 13-13)			
yright © 20	12 Univers	ity of Florida, All	Rights Reserve	d	<del></del>	HCS2010 <sup>™</sup>	Vers	ion 6.41	<del></del>	Generated:	12/9/2014 10:5

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		RA	MPS AND	RAMP JUN	CTIONS W	ORKSHE	EET				
General	l Infori		5711115		Site Infor						
Analyst		AJR		Fr	eeway/Dir of Tr		US-17	NB			
Agency or C		Atkin	S	Ju	ınction		5020-N	IB On from	Meeting		
Date Perfori			2014		ırisdiction						
Analysis Tin				Ar	nalysis Year		2018 B	Build - River	Center Site		
	cription	Navy Base IC	ΓF								
Inputs			IN	hanafi anaa Ni						1	
Upstream A	Ndj Ramp		1 '	ber of Lanes, N	4					Downstre	am Adj
Yes	On		Ramp Numbe		1					Ramp	
□ res			1	ane Length, L <sub>A</sub>	1125					□Yes	On
✓ No	☐ Off		Deceleration I	ane Length L <sub>D</sub>						☑ No	Off
			Freeway Volu	me, V <sub>F</sub>	2716						
_ <sub>up</sub> =	ft		Ramp Volume	e, V <sub>R</sub>	828					L <sub>down</sub> =	ft
	. 1. //		Freeway Free	-Flow Speed, S <sub>FF</sub>	55.0					V <sub>D</sub> =	veh/h
√ <sub>u</sub> =	veh/h		Ramp Free-Fl	ow Speed, S <sub>FR</sub>	45.0					V <sub>D</sub> -	VC11/11
Conver	sion to	pc/h Un	der Base	Conditions							
(pc/l		V	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	f <sub>p</sub>	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>
	'''	(Veh/hr)					_		· ·		
Freeway		2716	0.90	Level	2	0	_	990	1.00		3048
Ramp	$\longrightarrow$	828	0.90	Level	5	0	0.	976	1.00		943
UpStream DownStrea	m		$\vdash$								
Downouca			Merge Areas						iverge Areas		
Estimat	tion of					Estimati	ion o				
		V <sub>12</sub> = V <sub>F</sub>	(P)								
_				. 12 7)				$V_{12} = Y_{12}$	$V_R + (V_F - V_R)$	)P <sub>FD</sub>	
-EQ =			ation 13-6 or			L <sub>EQ</sub> =		(	Equation 13-	12 or 13-1	3)
P <sub>FM</sub> =				ion (Exhibit 13-6)		P <sub>FD</sub> = using Equation (Exhibit 13-7)					
/ <sub>12</sub> =		1154		- 40 44 - 40		V <sub>12</sub> = pc/h					
$V_3$ or $V_{av34}$		947 p 17)	c/n (Equatio	n 13-14 or 13-		${ m V_3}$ or ${ m V_{av34}}$			oc/h (Equation 1	3-14 or 13-1	17)
Is V <sub>2</sub> or V <sub>2</sub>	.24 > 2,700	) pc/h?	s 🗸 No			Is V <sub>3</sub> or V <sub>av3</sub>	<sub>34</sub> > 2,7	'00 pc/h?	]Yes □No		
		V <sub>12</sub> /2				Is V <sub>3</sub> or V <sub>av3</sub>	3 <sub>4</sub> > 1.5	5 * V <sub>12</sub> /2	]Yes □ No		
0 4.				on 13-16, 13-		If Yes,V <sub>12a</sub> =		1	c/h (Equatio	n 13-16, 1	3-18, or
f Yes,V <sub>12a</sub> =	=		13-19)					13	3-19)		
Capacit	ty Che	cks				Capacity	y Ch	ecks			
		Actual	C	Sapacity	LOS F?			Actual	Car	pacity	LOS F?
						$V_{F}$			Exhibit 13-8	3	
V <sub>F</sub>	_	3991	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>		Exhibit 13-8	3	
F						V <sub>R</sub>	$\neg$		Exhibit 13-	-	
									10		
Flow Er	ntering		fluence A		1/5.1.0.0	Flow En			ge Influen		r
		Actual		Desirable	Violation?		+ '	Actual	Max Desi	rable	Violation?
V <sub>R1</sub>		2162	Exhibit 13-8	4600:All	No	V <sub>12</sub>		<del>, </del>	Exhibit 13-8		_
			nination (			1			terminatio		<i>F)</i>
_			0.0078 V <sub>12</sub> - 0.0	00627 L <sub>A</sub>					.0086 V <sub>12</sub> - 0.	.009 L <sub>D</sub>	
		/ln)				$D_R = (p)$	c/mi/l	n)			
O <sub>R</sub> = 14	4.9 (pc/mi	,		LOS = B (Exhibit 13-2)				13-2)			
O <sub>R</sub> = 14		,				LUS = (E	- Al IIDIL				
O <sub>R</sub> = 14 -OS = B	3 (Exhibit 1	,				Speed D			n		
O <sub>R</sub> = 14 LOS = B <b>Speed L</b>	B (Exhibit 1	3-2) nination				Speed D		minatio	n		
$D_R = 14$ $LOS = B$ $Speed L$ $M_S = 0.5$	B (Exhibit 1  Detern  1.254 (Exib	3-2) <b>nination</b> it 13-11)				Speed D	<b>Deter</b> xhibit 1	minatio	n		
$D_R = 14$	B (Exhibit 1 Determ 0.254 (Exibit 1.7 mph (	3-2) <b>nination</b> it 13-11) Exhibit 13-11)				Speed D  D <sub>s</sub> = (E: S <sub>R</sub> = mp	Deter xhibit 1 ph (Exh	minatio 3-12) nibit 13-12)	n		
$D_{R} = 14$ $D_{S} = 14$ $D_{$	B (Exhibit 1  Detern  1.254 (Exibit 1.7 mph (1.3.5 mph	3-2) <b>nination</b> it 13-11)				$\begin{array}{c} \textbf{Speed D} \\ \textbf{D}_{\text{S}} = & (\text{E:} \\ \textbf{S}_{\text{R}} = & \text{mp} \\ \textbf{S}_{0} = & \text{mp} \end{array}$	Deter Exhibit 1 ph (Exh ph (Exh	<b>minatio</b> 3-12)	n		

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		RAI	MPS AND	RAMP JUN	CTIONS W	ORKSH	EET				
General	Infor		• ΑΙΙΒ		Site Infor						
Analyst		AJR		Fr	eeway/Dir of Tr		US-17	' NB			
Agency or C	ompany	Atkins	S	Ju	inction		5030-	NB On from	E Bay		
Date Perforr		7/25/2			ırisdiction						
Analysis Tim				Ar	nalysis Year		2018 I	Build - River	Center Site		
	cription	Navy Base ICT	F								
Inputs			le v							1	
Upstream A	dj Ramp		l '	ber of Lanes, N	4					Downstre	am Adj
Yes	On		Ramp Numbe		1					Ramp	
⊔ Yes	□ On		Acceleration L	ane Length, L <sub>A</sub>	925					☐Yes	On
✓ No	Off	:	Deceleration I	ane Length L <sub>D</sub>						✓ No	Off
			Freeway Volu	me, V <sub>F</sub>	3548					I	
L <sub>up</sub> =	ft		Ramp Volume	e, V <sub>R</sub>	327					L <sub>down</sub> =	ft
. ,			Freeway Free	-Flow Speed, S <sub>FF</sub>	55.0					V <sub>D</sub> =	voh/h
V <sub>u</sub> =	veh/h		1	ow Speed, S <sub>FR</sub>	45.0					v <sub>D</sub> –	veh/h
Convers	sion to			Conditions							
(pc/h		V	PHF	Terrain	%Truck	%Rv		f	f	V = V/DHI	= x f <sub>HV</sub> x f <sub>p</sub>
(pc/i	1)	(Veh/hr)	PHF	renam	% ITUCK	70 FCV		f <sub>HV</sub>	f <sub>p</sub>	V - V/F111	^ 'HV ^ 'p
Freeway		3548	0.90	Level	3	0	_	).985	1.00		1001
Ramp		327	0.90	Level	14	0	0	).935	1.00		389
UpStream DownStrear			$\vdash$				+				
DOWNStreat	II	I	I I Merge Areas						iverge Areas		
Estimation of V <sub>12</sub>				Estimati	ion (		Trongo Alicuo				
			/ D \					12			
		$V_{12} = V_F$		10 =				$V_{12} = Y_{12}$	$V_R + (V_F - V_R)$	)P <sub>FD</sub>	
-EQ =			ation 13-6 o			L <sub>EQ</sub> =		(	Equation 13-	12 or 13-1	3)
P <sub>FM</sub> =				tion (Exhibit 13-6)		P <sub>FD</sub> = using Equation (Exhibit 13-7)					
V <sub>12</sub> =		677 p				$V_{12} = pc/h$					
V <sub>3</sub> or V <sub>av34</sub>		1662 բ 17)	oc/h (Equati	on 13-14 or 13-		V <sub>3</sub> or V <sub>av34</sub>			oc/h (Equation 1	13-14 or 13-1	17)
Is V <sub>o</sub> or V	> 2 70	0 pc/h?	e V No				34 > 2,	700 pc/h?	]Yes □No		
		V <sub>12</sub> /2							Yes □ No		
				on 13-16, 13-		If Yes,V <sub>12a</sub> =			c/h (Equatio	n 13-16, 1	3-18, or
f Yes,V <sub>12a</sub> =		18, or		011 13-10, 13-		11 165, v <sub>12a</sub> –		13	3-19)		
Capacit	y Che	cks	,			Capacity	y Ch	ecks			
-		Actual	C	apacity	LOS F?			Actual	Ca	pacity	LOS F?
						V <sub>F</sub>			Exhibit 13-	8	
V <sub>FC</sub>		4390	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>		Exhibit 13-	8	
*FC	)	4000	EXHIBIT 10-0		110				Exhibit 13		_
						V <sub>R</sub>			10		
Flow En	tering	Merge In	1			Flow En	1		ge Influer		1
		Actual		Desirable	Violation?		-	Actual	Max Des	irable	Violation?
V <sub>R1</sub>		1989	Exhibit 13-8	4600:AII	No	V <sub>12</sub>			Exhibit 13-8		
		ice Detern	,						terminatio		<i>F</i> )
D <sub>R</sub> =	5.475 +	0.00734 v <sub>R</sub> + 0	0.0078 V <sub>12</sub> - 0.0	00627 L <sub>A</sub>		"	D <sub>R</sub> =	4.252 + 0	.0086 V <sub>12</sub> - 0	.009 L <sub>D</sub>	
$O_R = 15$	5.0 (pc/m	i/ln)				$D_R = (p$	c/mi/	ln)			
OS = B	(Exhibit	13-2)				LOS = (E	xhibi	it 13-2)			
Speed Determination				Speed D	ete	rminatio	n				
		oit 13-11)						13-12)			
•		Exhibit 13-11)				1		hibit 13-12)			
11		•						hibit 13-12)			
•		Exhibit 13-11) Exhibit 13-13)				ľ	•	hibit 13-12)			
		·	Diahte D-							Constitut	10/0/0044 40
yright © 201	2 Univers	ity of Florida, All	<b>Rights Reserve</b>	d		HCS2010 <sup>™</sup>	\/erci	ion 6 41		Generated: 1	12/9/2014 10:

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		MPS AND	RAMP JUN			ET			
General Infor	mation			Site Infor	mation				
Analyst	AJR		Fr	eeway/Dir of Tr	avel U	JS-17 NB			
Agency or Company				nction	5	030-NB On from	n E Bay		
Date Performed		/2014		risdiction					
Analysis Time Perio			Ar	nalysis Year	2	018 Build - Rive	r Center Site		
Project Description Inputs	Navy Base IC	IF.							
•		Eroowov Numb	per of Lanes, N	4				1	
Jpstream Adj Ramp		1 '		•				Downstre	eam Adj
☐ Yes ☐ Or	n	Ramp Number		1				Ramp	
	ı	Acceleration La	,,	925				Yes	On
☑ No ☐ Of	f	Deceleration L	ane Length L <sub>D</sub>					☑ No	Off
		Freeway Volur	ne, V <sub>F</sub>	3544					
<sub>up</sub> = ft		Ramp Volume	, V <sub>R</sub>	1143				L <sub>down</sub> =	ft
, , , , , , , , , , , , , , , , , , , ,		Freeway Free-	Flow Speed, S <sub>FF</sub>	55.0					vob/b
$I_{\rm u} = {\rm veh/h}$	ı	Ramp Free-Flo	ow Speed, S <sub>ED</sub>	45.0				$V_D =$	veh/h
Conversion t	o pc/h Un		111						
	V	PHF PHF		0/ Tal-	0/ D	f	f	v = V/DL	Evf vf
(pc/h)	(Veh/hr)	YMF	Terrain	%Truck	%Rv	f <sub>HV</sub>	f <sub>p</sub>	v - v/PF	IF x f <sub>HV</sub> x f <sub>p</sub>
Freeway	3544	0.90	Level	3	0	0.985	1.00		3997
Ramp	1143	0.90	Level	3	0	0.985	1.00	<del>                                     </del>	1289
UpStream	<u> </u>							-	
DownStream		Morgo Aroso					L Diverge Areas		
Estimation o		Merge Areas			Estimation	on of v	Diverge Areas		
					LStillatio	11 01 12			
	$V_{12} = V_{F}$					V <sub>12</sub> =	V <sub>R</sub> + (V <sub>F</sub> - V	<sub>R</sub> )P <sub>FD</sub>	
-EQ =	(Equ	ation 13-6 or	13-7)		L <sub>EQ</sub> =		(Equation 13		13)
P <sub>FM</sub> =	0.057	using Equati	on (Exhibit 13-6)		P <sub>FD</sub> = using Equation (Exhibit 13-7)				
/ <sub>12</sub> =	227 p	c/h			V <sub>12</sub> =		pc/h	OTT (EXTINATE	.0.,
/ <sub>3</sub> or V <sub>av34</sub>	1885	pc/h (Equation	n 13-14 or 13-		V <sub>3</sub> or V <sub>av34</sub>		pc/h (Equation	12 14 or 12	17\
	17)								-17)
Is $V_3$ or $V_{av34} > 2,70$						> 2,700 pc/h? [			
Is $V_3$ or $V_{av34} > 1.5$						> 1.5 * V <sub>12</sub> /2 [			12 10 or
f Yes,V <sub>12a</sub> =		pc/h (Equation	on 13-16, 13-		If Yes,V <sub>12a</sub> =		pc/h (Equation 3-19)	011 13-10,	13-10, 01
		13-19)			Canacity				
Capacity Che	,	1 0	ana aitu	1.00.52	Capacity		1 0	ana aitu	1,00,50
	Actual		apacity	LOS F?	\/	Actual		apacity	LOS F?
					V <sub>F</sub>		Exhibit 13	_	
$V_{FO}$	5286	Exhibit 13-8		No	$V_{FO} = V_{F}$ -	V <sub>R</sub>	Exhibit 13		
					$V_R$		Exhibit 1:	3-	
Flow Entering	a Morgo Ir	ofluoneo A	roa	<u> </u>	Flow Ent	ering Dive		nco Aro	<u> </u>
TOW LINEIN	Actual	7	Desirable	Violation?	FIOW LITE	Actual	Max De		Violation?
V <sub>R12</sub>	2887	Exhibit 13-8	4600:All	No	V <sub>12</sub>	Actual	Exhibit 13-8	Silable	Violations
Level of Serv				140		l Service De		on /if no	<u> </u>
					1			•	<i>( )</i>
		0.0078 V <sub>12</sub> - 0.0	0021 LA			$_{R} = 4.252 + 0$	uoo v <sub>12</sub> - (	0.009 L <sub>D</sub>	
$D_{R} = 21.6 \text{ (pc/n)}$						:/mi/ln)			
.OS = C (Exhibit					`	khibit 13-2)			
	nination				Speed De	eterminatio	on		
Speed Deterr					$D_s = (Ex$	hibit 13-12)			
	bit 13-11)								
<b>Speed Detern</b> M <sub>S</sub> = 0.308 (Exi					S <sub>R</sub> = mpl	h (Exhibit 13-12)			
$M_{\rm S} = 0.308 \text{ (Exi}$ $S_{\rm R} = 51.0 \text{ mph}$	(Exhibit 13-11)								
$M_{\rm S} = 0.308 \text{ (Exion S}_{\rm R} = 51.0 \text{ mph}$ $S_0 = 52.5 \text{ mph}$					S <sub>0</sub> = mpl	h (Exhibit 13-12) h (Exhibit 13-12) h (Exhibit 13-13)			

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed	AJR Atkins 7/25/2014		Highway/Direction of Trave From/To Jurisdiction	5040-E	NB Bay to SC-703 uild - River Center
Analysis Time Period	AM Peak		Analysis Year	Site	and - Niver Cerner
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			es.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	3875	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 4	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi	
Calculate Flow Adjus	tments				
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1)] 0.980	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	4		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	55.0	mph	FFS	55.0	mph
Base free-flow Speed, BFFS		mph			<u> </u>
LOS and Performanc	e Measures	<u> </u>	Design (N)		
Operational (LOS)  V <sub>p</sub> = (V or DDHV) / (PHF x I	N x f <sub>HV</sub> 1098	pc/h/ln	Design (N) Design LOS v <sub>p</sub> = (V or DDHV) / (PHF x	N x f <sub>HV</sub>	no/h/ln
x f <sub>p</sub> )	<i>55.0</i>	mnh	x f <sub>p</sub> )		pc/h/ln
S D = v <sub>p</sub> / S	55.0 20.0	mph pc/mi/ln	S		mph
LOS	20.0 C	ρο/πι/π	$D = v_p / S$		pc/mi/ln
			Required Number of Lane	s, N	
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed DDHV - Directional design	BFFS - Ba		$E_R$ - Exhibits 11-10, 11-12 $E_T$ - Exhibits 11-10, 11-11 $f_p$ - Page 11-18 LOS, S, FFS, $v_p$ - Exhibits 11-3	, 11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed	AJR Atkins 7/25/2014		Highway/Direction of Trave From/To Jurisdiction	5040-E	Bay to SC-703
Analysis Time Period	PM Peak		Analysis Year	2018 Bi Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Pla	nning Data
Flow Inputs					
Volume, V AADT	4687	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 3	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1)] 0.985	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	4		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	55.0	mph	FFS	55.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performanc	e Measures	3	Design (N)		
Operational (LOS) v <sub>p</sub> = (V or DDHV) / (PHF x	N x f <sub>HV 1321</sub>	pc/h/ln	Design (N) Design LOS v <sub>p</sub> = (V or DDHV) / (PHF x	N y f	
x f <sub>p</sub> )		•	$x f_p$	IN A IHV	pc/h/ln
S / S	55.0	mph	s		mph
$D = v_p / S$	24.0	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	С		Required Number of Lane	s, N	
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed DDHV - Directional design	BFFS - Ba		$E_R$ - Exhibits 11-10, 11-12 $E_T$ - Exhibits 11-10, 11-11, $f_p$ - Page 11-18 LOS, S, FFS, $v_p$ - Exhibits 11-3	11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1

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# MAJOR DIVERGE SEGMENTS ANALYSIS ATKINS

#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2018 Build-River Center Site AM Peak Navy Base ICTF Freeway/Direction Junction Segment ID US-17 NB Off to SC-703 5050

#### Inputs

	Freeway Upstream of Off-Ramp	Freeway Downstream of Off-Ramp	Off-Ramp
Number of Lanes, N	4	2	2
Free-Flow Speed, FFS (mph)	55	45	40
Volume, V (veh/h)	3,875	2,822	1,053
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	4%	2%	8%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.98	0.99	0.96
Demand Flow Rate, $v_p$ (pc/h/ln)	1,098	1,583	608
Capacity Flow Rate, c (pc/h/ln)	2,200	2,100	2,000
v/c ratio	0.50	0.75	0.30
Density, D <sub>MD</sub> (pc/mi/ln)	19.2	27.7	10.6
LOS	В	С	В

#### Formulas and Reference Material

PHF\*N\*f<sub>HV</sub>\*f<sub>P</sub>

$$f_{HV} = \frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

$$D_{MD} = \frac{0.0175^*v_f}{N}$$
 HCM 2010, Equation 13-26

Ramp Roadways Max Service
Flow Rates

1 IOW Hates				
	Capacity			
FFS (mi/h)	(pc/h/ln)			
> 50	2,200			
>40-50	2,100			
>30-40	2,000			
≥20-30	1,900			
<20	1,800			

Source: HCM 2010, Exhibit 13-10

Diverge LOS Thresholds

21101g0 20	
	Density
LOS	(pc/mi/ln)
Α	≤10
В	>10-20
С	>20-28
D	>28-35
Е	>35
F	v/c > 1

# MAJOR DIVERGE SEGMENTS ANALYSIS ATKINS

#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2018 Build-River Center Site PM Peak Navy Base ICTF Freeway/Direction Junction Segment ID US-17 NB Off to SC-703 5050

#### Inputs

	Freeway Upstream of Off-Ramp	Freeway Downstream of Off-Ramp	Off-Ramp
Number of Lanes, N	4	2	2
Free-Flow Speed, FFS (mph)	55	45	40
Volume, V (veh/h)	4,687	3,201	1,486
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	3%	2%	5%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, $f_{\rm HV}$	0.99	0.99	0.98
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	1,321	1,796	846
Capacity Flow Rate, c (pc/h/ln)	2,200	2,100	2,000
v/c ratio	0.60	0.86	0.42
Density, D <sub>MD</sub> (pc/mi/ln)	23.1	31.4	14.8
LOS	С	D	В

#### Formulas and Reference Material

$$f_{HV} = \frac{1}{1 + P_T(E_{T}^{-1}) + P_R(E_{R}^{-1})}$$

HCM 2010, Equation 11-3

$$V_p = \frac{V}{PHF^*N^*f_{HV}^*f_P}$$
 HCM 2

HCM 2010, Equation 11-2

$$D_{MD} = \frac{0.0175 * v_f}{N}$$

HCM 2010, Equation 13-26

# Ramp Roadways Max Service Flow Rates

1 IOW Hales			
	Capacity		
FFS (mi/h)	(pc/h/ln)		
> 50	2,200		
>40-50	2,100		
>30-40	2,000		
≥20-30	1,900		
<20	1,800		

Source: HCM 2010, Exhibit 13-10

#### Diverge LOS Thresholds

ziroigo zoo iiii concido			
	Density		
LOS	(pc/mi/ln)		
Α	≤10		
В	>10-20		
С	>20-28		
D	>28-35		
Е	>35		
F	v/c > 1		

# RAMP ADD OR DROP LANE ANALYSIS (MAINLINE <55 MPH) ATKINS

#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2018 Build-River Center Site AM Peak Navy Base ICTF Freeway/Direction Junction Segment ID

US-17 NB Off to Bowman 5060

#### Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	3	2	1
Free-Flow Speed, FFS (mph)	45	45	45
Volume, V (veh/h)	2,156	1,489	667
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	4%	6%	2%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.98	0.97	0.99
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	814	852	749
Capacity Flow Rate, c (pc/h/ln)	2,100	2,100	2,100
v/c ratio	0.39	0.41	0.36
Density, D <sub>MD</sub> (pc/mi/ln)	14.2	14.9	13.1
LOS	В	В	В

#### Formulas and Reference Material

$$f_{HV} =$$

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

HCM 2010, Equation 11-2

$$D_{MD} =$$

HCM 2010, Equation 13-26

# Ramp Roadways Max Service Flow Rates

1 IOW Hates			
	Capacity		
FFS (mi/h)	(pc/h/ln)		
> 50	2,200		
>40-50	2,100		
>30-40	2,000		
≥20-30	1,900		
<20	1,800		

Source: HCM 2010, Exhibit 13-10

#### Diverge LOS Thresholds

Direige Eee Timeenede			
	Density		
LOS	(pc/mi/ln)		
Α	≤10		
В	>10-20		
С	>20-28		
D	>28-35		
Е	>35		
F	v/c > 1		

# RAMP ADD OR DROP LANE ANALYSIS (MAINLINE <55 MPH) ATKINS

#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2018 Build-River Center Site PM Peak Navy Base ICTF Freeway/Direction Junction Segment ID

US-17 NB Off to Bowman 5060

#### Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	3	2	1
Free-Flow Speed, FFS (mph)	45	45	45
Volume, V (veh/h)	3,036	2,338	698
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	3%	4%	2%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.99	0.98	0.99
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	1,141	1,325	783
Capacity Flow Rate, c (pc/h/ln)	2,100	2,100	2,100
v/c ratio	0.54	0.63	0.37
Density, D <sub>MD</sub> (pc/mi/ln)	20.0	23.2	13.7
LOS	В	C	В

#### Formulas and Reference Material

$$f_{HV} =$$

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

HCM 2010, Equation 11-2

$$D_{MD} =$$

HCM 2010, Equation 13-26

# Ramp Roadways Max Service Flow Rates

1 IOW Hales			
	Capacity		
FFS (mi/h)	(pc/h/ln)		
> 50	2,200		
>40-50	2,100		
>30-40	2,000		
≥20-30	1,900		
<20	1,800		

Source: HCM 2010, Exhibit 13-10

#### Diverge LOS Thresholds

Direige Eee Timeenede			
	Density		
LOS	(pc/mi/ln)		
Α	≤10		
В	>10-20		
С	>20-28		
D	>28-35		
Е	>35		
F	v/c > 1		

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed Analysis Time Period	AJR Atkins 4/25/2014 AM Peak		Highway/Direction of Trave From/To Jurisdiction Analysis Year	5065-Bo Bowma	owman Off to
Project Description Navy	Base ICTF			Site	
✓ Oper.(LOS)			Des.(N)	Plaı	nning Data
Flow Inputs					
Volume, V AADT Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D	1489	veh/h veh/day veh/h	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub> %RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0.90 6 0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub> E <sub>T</sub>	1.00 1.5		$E_R$ $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1.2 1)] 0.971	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance Number of Lanes, N	2	ft	f <sub>LW</sub>		mph mph
Total Ramp Density, TRD FFS (measured) Base free-flow Speed,	55.0	ramps/mi mph mph	TRD Adjustment FFS	55.0	mph mph
BFFS		<u> </u>	- AD		
LOS and Performanc	e Measures	<b>S</b>	Design (N)		
Operational (LOS) $v_p = (V \text{ or DDHV}) / (PHF \times V)$ $x f_p)$ $S$ $D = v_p / S$ $LOS$	N x f <sub>HV</sub> 852 55.0 15.5 B	pc/h/ln mph pc/mi/ln	Design (N) Design LOS $v_p = (V \text{ or DDHV}) / (PHF \text{ x} \text{ x } f_p)$ S $D = v_p / S$ Required Number of Lanes		pc/h/ln mph pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed DDHV - Directional design	BFFS - Ba		$E_R$ - Exhibits 11-10, 11-12 $E_T$ - Exhibits 11-10, 11-11, $f_p$ - Page 11-18 LOS, S, FFS, $v_p$ - Exhibits 11-3	11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>US-17 N</i>	NB
Agency or Company	Atkins		From/To	5065-Bo	owman Off to
Date Performed	7/25/2014		Jurisdiction	Bowmai	n On
Analysis Time Period	PM Peak		Analysis Year	2018 Bu Site	ıild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	☐ Plar	nning Data
Flow Inputs					
Volume, V AADT	2338	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 4	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments				
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] 0.980	
Speed Inputs			Calc Speed Adj and		
Lane Width		ft	<u> </u>		
Rt-Side Lat. Clearance		ft	f <sub>LW</sub>		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	55.0	mph		<i>EE</i> 0	
Base free-flow Speed,		·	FFS	55.0	mph
BFFS		mph			
LOS and Performanc	e Measures	<u> </u>	Design (N)		
Operational (LOS)			Design (N)		
Operational (LOS)	N v f		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x)$	11 X 1 <sub>HV</sub> 1325	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	$N \times f_{HV}$	20/b/lp
x f <sub>p</sub> )	<i>55.0</i>	mnh	x f <sub>p</sub> )		pc/h/ln
D = v / S	55.0 24.1	mph	s		mph
$D = v_p / S$	24.1	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	С		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed	E Evhibite 11 10 11 12		f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		
v <sub>n</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		se free-flow	f <sub>p</sub> - Page 11-18	44.0	TRD - Page 11-11
speed			LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-2,	
DDHV - Directional design	hour volume		111-0		

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Navy Base ICTF

			REEWAY	WEAV			T		
Genera	al Information	on			Site Info	rmation			
	ormed ime Period	AJR Atkins 7/25/20 AM Pea			Freeway/Dir Weaving Seg Analysis Yea	gment Location	on Off		to I-526 WB Center Site
	scription Navy Ba	ase ICTF							
Inputs					1				
Weaving n	configuration number of lanes, N egment length, L <sub>c</sub>			One-Sided 3 825ft	Segment type				C-D Roadway Multiland Highway
_	ree-flow speed, Fl	,		45 mph	Freeway min Freeway max				1: 2250
					Terrain type	аттатт бараб	y, ⊙ <sub>⊪L</sub>		Leve
Conve	rsions to po	c/h Unde	r Base Co	ndition	S				
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	$f_{HV}$	fp	v (pc/h)
$V_{FF}$	797	0.90	6	0	1.5	1.2	0.971	1.00	912
$V_{RF}$	248	0.90	14	0	1.5	1.2	0.935	1.00	295
$V_{FR}$	692	0.90	6	0	1.5	1.2	0.971	1.00	792
$V_{RR}$	215	0.90	14	0	1.5	1.2	0.935	1.00	256
$V_{NW}$	1168							V =	2255
$V_{W}$	1087								
VR	0.482								
Config	uration Cha	aracteris	tics						
Minimum	maneuver lanes, I	$N_{WL}$		2 lc	Minimum we	aving lane cl	hanges, LC <sub>MIN</sub>		1087 lc/h
1	ge density, ID			0.3 int/mi	Weaving lan	e changes, L	.C <sub>w</sub>		1186 lc/h
	RF lane changes,	* **			Non-weaving lane changes, LC <sub>NW</sub>				110 lc/h
	FR lane changes,	111		1 lc/pc	Total lane changes, LC <sub>ALL</sub>			1296 lc/h	
Minimum	RR lane changes,	, LC <sub>RR</sub>		lc/pc	Non-weaving	g vehicle inde	ex, I <sub>NW</sub>		29
Weavir	ng Segment	t Speed,	Density, I	_evel of	Service,	and Cap	acity		
Weaving s	segment flow rate	, V		2255 pc/h	Weaving intensity factor, W				0.323
voaving oogmone dapatity, o <sub>w</sub> 4654 veri/ii			Weaving segment speed, S			35.4 mph			
	segment v/c ratio	_	_	0.453	Average wea				37.7 mph
	segment density, I	ט	2	1.2 pc/mi/ln	Average non				33.6 mph
	ervice, LOS			В	Maximum we	eaving length	ı, L <sub>MAX</sub>		7617 ff
Chapter 13	segments longer th , "Freeway Merge a nes that exceed the	and Diverge Se	gments".	-		solated merge	and diverge are	eas using the	procedures of

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Navy Base ICTF

			REEWA	WEAV			Τ		
Genera	I Informati	on			Site Info	rmation			
Analyst AJR Agency/Company Atkins Date Performed 7/25/2014 Analysis Time Period PM Peak			Freeway/Dir Weaving Seç Analysis Yea	gment Location	on Off	7 NB -Bowman On Build - River			
Project Des Inputs	scription Navy B	ase ICTF							
Weaving co Weaving no Weaving so Freeway fro	onfiguration umber of lanes, N egment length, L ee-flow speed, Fl	s FS		45 mph	Freeway max Terrain type	imum speed			C-D Roadway Multilane Highways 15 2250 Leve
Conver	sions to po	c/h Unde	1	ndition		1			
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	$f_{HV}$	fp	v (pc/h)
$V_{FF}$	1682	0.90	4	0	1.5	1.2	0.980	1.00	1906
$V_{RF}$	591	0.90	7	0	1.5	1.2	0.966	1.00	680
$V_{FR}$	656	0.90	4	0	1.5	1.2	0.980	1.00	743
$V_{RR}$	230	0.90	7	0	1.5	1.2	0.966	1.00	265
$V_{NW}$	2171							V =	3594
$V_W$	1423								
VR	0.396								
Config	uration Cha	aracteris	tics						
Minimum r	maneuver lanes,	N <sub>WL</sub>		2 lc	Minimum we	eaving lane cl	nanges, LC <sub>MIN</sub>	I	1423 lc/h
Interchang	e density, ID			0.3 int/mi	Weaving lan	e changes, L	$C_{W}$		1522 lc/h
Minimum F	RF lane changes,	, LC <sub>RF</sub>		1 lc/pc	Non-weaving lane changes, LC <sub>NW</sub>			317 lc/h	
Minimum F	R lane changes,	, LC <sub>FR</sub>		1 lc/pc	Total lane changes, LC <sub>ALL</sub>			1839 lc/h	
Minimum F	RR lane changes	, LC <sub>RR</sub>		lc/pc	Non-weaving vehicle index, I <sub>NW</sub>			54	
Weavin	g Segmen	t Speed,	Density, I	_evel of	Service,	and Cap	acity		
Weaving segment flow rate, v 3594 pc/h Weaving segment capacity, c <sub>w</sub> 5309 veh/h			Weaving seg	ensity factor, gment speed	, S		0.425 31.4 mph		
Weaving segment v/c ratio 0.664					36.0 mph				
1	egment density,	D	38	3.1 pc/mi/ln	Average nor				29.0 mph
Level of Se	Level of Service, LOS E			E	Maximum w	eaving length	ı, L <sub>max</sub>		6636 ff
Chapter 13,	segments longer t "Freeway Merge a nes that exceed the	and Diverge Se	egments".	_		solated merge	and diverge ar	eas using the	procedures of

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	5075-52 WB On	26 WB Off to 526
Date Performed	7/25/2014		Jurisdiction		
Analysis Time Period	AM Peak		Analysis Year	2018 Βι Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	1045	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 6	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length	Level mi	
DDIIV - AADI XIXXD		VCII/II	Up/Down %	1111	
Calculate Flow Adjus	tments				
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	I)] <i>0.971</i>	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	55.0	mph	FFS	55.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performanc	e Measures	 S	Design (N)		
			Design (N)		
Operational (LOS)			Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x I)$	N x f <sub>HV</sub> 598	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>uv</sub>	
x f <sub>p</sub> )		•	x f <sub>p</sub> )	п۷	pc/h/ln
S	55.0	mph	S P		mph
$D = v_p / S$	10.9	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	Α		Required Number of Lanes	s, N	·
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed			f Evhihit 11.0
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>p</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18	11 2	TRD - Page 11-1
speed	haur valeraa		LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-∠,	
DDHV - Directional design	nour volume				

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>US-17 l</i>	NB
Agency or Company	Atkins		From/To	5075-52	26 WB Off to 526
Date Performed	7/25/2014		Jurisdiction	WB On	
Analysis Time Period	PM Peak		Analysis Year	2018 Bu Site	ıild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	☐ Plar	nning Data
Flow Inputs					
Volume, V AADT	2273	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 4	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$		
Speed Inputs	1.0		Calc Speed Adj and		
<u> </u>			Calc Speed Auj and		
Lane Width		ft			
Rt-Side Lat. Clearance Number of Lanes, N	2	ft	f <sub>LW</sub>		mph
·	2		$f_{LC}$		mph
Total Ramp Density, TRD	<i>EE</i> 0	ramps/mi	TRD Adjustment		mph
FFS (measured) Base free-flow Speed,	55.0	mph	FFS	55.0	mph
BFFS		mph			
LOS and Performanc	e Measures	5	Design (N)		
			Design (N)		
Operational (LOS)	M f		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x I x f_p)$	N X T <sub>HV</sub> 1288	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	pc/h/ln
s	55.0	mph	x f <sub>p</sub> ) S		mph
$D = v_p / S$	23.4	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	С		Required Number of Lanes	s, N	ролили
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed			f Evhihit 11 0
V - Hourly volume	D - Dens		$E_{R}$ - Exhibits 11-10, 11-12 $E_{T}$ - Exhibits 11-10, 11-11,		f <sub>LW</sub> - Exhibit 11-8
v <sub>n</sub> - Flow rate		e-flow speed	'	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		se free-flow	f <sub>p</sub> - Page 11-18	11 2	TRD - Page 11-11
speed DDHV - Directional design	hour volume		LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-4,	

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# RAMP ADD OR DROP LANE ANALYSIS (MAINLINE <55 MPH) ATKINS

#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2018 Build-River Center Site AM Peak Navy Base ICTF Freeway/Direction Junction Segment ID US 17 NB From I-526 WB 5080

#### Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	2	3	1
Free-Flow Speed, FFS (mph)	45	45	45
Volume, V (veh/h)	1,045	1,350	305
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	6%	6%	13%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, f <sub>HV</sub>	0.97	0.97	0.94
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	598	515	361
Capacity Flow Rate, c (pc/h/ln)	2,100	2,100	2,100
v/c ratio	0.28	0.25	0.17
Density, D <sub>MD</sub> (pc/mi/ln)	10.5	9.0	6.3
LOS	В	A	Α

#### Formulas and Reference Material

$$f_{HV} =$$

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

HCM 2010, Equation 11-2

$$D_{MD} =$$

HCM 2010, Equation 13-26

# Ramp Roadways Max Service Flow Rates

I IOW Na	162
	Capacity
FFS (mi/h)	(pc/h/ln)
> 50	2,200
>40-50	2,100
>30-40	2,000
≥20-30	1,900
<20	1,800

Source: HCM 2010, Exhibit 13-10

#### Diverge LOS Thresholds

21101g0 20	
	Density
LOS	(pc/mi/ln)
Α	≤10
В	>10-20
С	>20-28
D	>28-35
Е	>35
F	v/c > 1

# RAMP ADD OR DROP LANE ANALYSIS (MAINLINE <55 MPH) ATKINS

#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2018 Build-River Center Site PM Peak Navy Base ICTF Freeway/Direction Junction Segment ID

US 17 NB From I-526 WB 5080

#### Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	2	3	1
Free-Flow Speed, FFS (mph)	45	45	45
Volume, V (veh/h)	2,273	2,709	436
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	4%	4%	8%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.98	0.98	0.96
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	1,288	1,023	504
Capacity Flow Rate, c (pc/h/ln)	2,100	2,100	2,100
v/c ratio	0.61	0.49	0.24
Density, D <sub>MD</sub> (pc/mi/ln)	22.5	17.9	8.8
LOS	С	В	А

#### Formulas and Reference Material

$$f_{HV}\,=\,$$

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

HCM 2010, Equation 11-2

$$D_{MD} =$$

HCM 2010, Equation 13-26

# Ramp Roadways Max Service Flow Rates

1 IOW Hales			
	Capacity		
FFS (mi/h)	(pc/h/ln)		
> 50	2,200		
>40-50	2,100		
>30-40	2,000		
≥20-30	1,900		
<20	1,800		

Source: HCM 2010, Exhibit 13-10

#### Diverge LOS Thresholds

2110190 20	0 111100110100
	Density
LOS	(pc/mi/ln)
Α	≤10
В	>10-20
С	>20-28
D	>28-35
Е	>35
F	v/c > 1

General Info	rmation	13/3/11/1	S AND RAN	Site Infor						
Analyst	AJR			reeway/Dir of Tr		US-17 S	2D			
Agency or Compar				unction			ff to I-526	ED		
ate Performed	=	/2014		urisdiction		0010-0	11 (0 1-320	ED		
Analysis Time Peri				nalysis Year		2018 B	uild - Rivo	Center Site		
Project Description			,,	naiyolo i cai		2010 0	uliu - Mivel	Certier Oile		
nputs	Travy Bass to									
Upstream Adj	Ramp	Freeway Num	ber of Lanes, N	2					Downstrea	am Adi
		Ramp Numbe	r of Lanes, N	1					Ramp	
□Yes	On	Acceleration L	ane Length, L <sub>A</sub>						□Yes	On
✓ No	Off	1	ane Length L <sub>D</sub>	450					☑ No	Off
1 -	ш	Freeway Volu		2173						ft
L <sub>up</sub> =	ft	Ramp Volume	13	359					L <sub>down</sub> =	10
V,, =	veh/h		-Flow Speed, $S_{FF}$	55.0					V <sub>D</sub> =	veh/h
*u	VCIIIII	Ramp Free-Fl	ow Speed, S <sub>FR</sub>	45.0					D	
Conversion		der Base (	Conditions							
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	f <sub>p</sub>	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>
reeway	2173	0.90	Level	6	0	0.9	971	1.00	24	l87
Ramp	359	0.90	Level	3	0	0.0	985	1.00	4	05
JpStream										
DownStream										
atimatian d		Merge Areas			Catimas	ion o		Diverge Areas		
stimation o	οτ ν <sub>12</sub>				Estimat	ion o				
	$V_{12} = V_{F}$	(P <sub>FM</sub> )					V <sub>12</sub> =	$V_R + (V_F - V_F)$	R)P <sub>FD</sub>	
EQ =	(Equa	ation 13-6 or	13-7)		L <sub>EQ</sub> =		(	Equation 13-1	2 or 13-13	5)
FM =	using	Equation (E	Exhibit 13-6)		P <sub>FD</sub> =		1.	000 using Equ	uation (Exhi	ibit 13-7)
' <sub>12</sub> =	pc/h				V <sub>12</sub> =		24	l87 pc/h		
or V <sub>av34</sub>	•	(Equation 13	-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>			pc/h (Equation	n 13-14 oi	r 13-17)
s V <sub>3</sub> or V <sub>av34</sub> > 2,7			,			., > 2.70		Yes ☑ No		,
s $V_3$ or $V_{av34} > 1.5$								Yes ☑ No		
0 0.0.			-16, 13-18, or					c/h (Equation	13-16 13	-18 or 13
Yes,V <sub>12a</sub> =	13-19	: •	10, 10 10, 01		If Yes,V <sub>12a</sub> =	=		9)	10 10, 10	10, 01 10
Capacity Ch	ecks				Capacit	y Che	ecks			
	Actual	C	apacity	LOS F?			Actual	Ca	pacity	LOS F
					$V_{F}$		2487	Exhibit 13-8	4500	No
$V_{FO}$		Exhibit 13-8		1	$V_{FO} = V_{F}$	- V <sub>R</sub>	2082	Exhibit 13-8	4500	No
					V <sub>R</sub>		405	Exhibit 13-1	0 2100	No
low Enterin	na Merae Ir	ofluence A	rea			terin	a Dive	rge Influen	ce Area	
	Actual		Desirable	Violation?		_	Actual	Max Desirab		Violation
V <sub>R12</sub>		Exhibit 13-8			V <sub>12</sub>	2	487	Exhibit 13-8	4400:All	No
	vice Deteri		f not F)			Serv	rice De	terminatio	n (if not	<del> </del>
evel of Ser								.0086 V <sub>12</sub> - 0.	•	- /
		12	отосошт –д			-к . 1.6 (рс/		12 0.	-Б	
D <sub>R</sub> = 5.475 + 0					I		,			
$D_{R} = 5.475 + 0$					ILOG - C	(EXIII	oit 13-2)			
$D_R = 5.475 + 0$ $D_R = \frac{1}{2}$ (pc/mi/los = (Exhibit	t 13-2)					2040	na i na a 4: -			
OS = (Exhibi	t 13-2)				Speed L					
$D_R = 5.475 + 0$ $R_R = (pc/mi/los)$ OS = (Exhibi) <b>Speed Deter</b>	t 13-2)				<b>Speed D</b> D <sub>s</sub> = 0.	334 (E	xhibit 13-	-12)		
$D_R = 5.475 + 0$ $B_R = (pc/mi/l)$ $D_R = (Exhibi)$ $D_R = (Exhibi)$ $D_R = (Exhibi)$	t 13-2)				<b>Speed L</b> D <sub>s</sub> = 0. S <sub>R</sub> = 50	334 (E: 0.7 mph	xhibit 13- (Exhibit	-12) 13-12)		
$D_R = 5.475 + 0$ $D_R = 6.475 + 0$ $D_R = 6.47$	rmination 13-11)				<b>Speed L</b> D <sub>s</sub> = 0. S <sub>R</sub> = 50	334 (E: 0.7 mph	xhibit 13-	-12) 13-12)		

F-4110

General In	formation	1 AZAIVII V	S AILD IVAIII	IP JUNCTI Site Infor						
		1	F-			110 47	CD.			
Analyst Agency or Comp	AJR pany Atki			reeway/Dir of Tr unction		US-17	SB off to I-526	ED.		
ate Performed	=	5/2014		urisdiction		0010-0	11 (0 1-320	ED		
analysis Time Pe		Peak		nalysis Year		2018 B	uild - River	Center Site		
	on Navy Base IC		7 11	naiyolo i cai		2010 0	uliu - IXIVEI	Certier Oile		
nputs	on many bass to	• • • • • • • • • • • • • • • • • • • •								
Upstream A	di Domo	Freeway Num	per of Lanes, N	2					Downstre	am Adi
Opsilealii A	iuj Kamp	Ramp Number		1					Ramp	aiii Auj
☐Yes	☐ On	Acceleration L	ane Length, L						Yes	On
✓ No	□ Off	1	ane Length L	450						
<b>™</b> INO	☐ Off	Freeway Volui		1716					✓ No	Off
L <sub>up</sub> =	ft	Ramp Volume		290					L <sub>down</sub> =	ft
ир		1	Flow Speed, S <sub>FF</sub>	55.0						
$V_u =$	veh/h		ow Speed, S <sub>FR</sub>						$V_D =$	veh/h
				45.0						
onversio	n to pc/h Un	der Base (	Conditions	1	i e	_				
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		$f_{HV}$	f <sub>p</sub>	v = V/PHF	$x f_{HV} x f_{p}$
reeway	1716	0.90	Level	4	0	0.9	980	1.00	1	945
Ramp	290	0.90	Level	3	0	0.9	985	1.00	3	327
JpStream										
DownStream										
		Merge Areas			=			Diverge Areas		
stimation	of V <sub>12</sub>				Estimat	ion o	t v <sub>12</sub>			
	$V_{12} = V_{F}$	(P <sub>FM</sub> )					V <sub>12</sub> =	V <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>	R)P <sub>FD</sub>	
EQ =	(Equ	ation 13-6 or	13-7)		L <sub>EQ</sub> =		(	Equation 13-1	2 or 13-13	3)
- = FM =	usino	g Equation (E	xhibit 13-6)		P <sub>FD</sub> =		1.	000 using Equ	uation (Exh	ibit 13-7)
' <sub>12</sub> =	pc/h	, , ,	,		V <sub>12</sub> =			945 pc/h	(	,
or V <sub>av34</sub>	•	(Equation 13-	14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>			pc/h (Equatio	n 13-14 o	r 13-17)
	2,700 pc/h? ☐ Y€		110110117			> 2.7		Yes ☑ No	11 10 11 0	1 10 17)
	1.5 * V <sub>12</sub> /2							Yes ✓ No		
0 0,01			-16, 13-18, or					oc/h (Equation	13_16 13	-18 or 13.
Yes,V <sub>12a</sub> =	13-19	: .	10, 10-10, 01		If Yes,V <sub>12a</sub> =	=		9)	10-10, 10	-10, 01 10
Capacity C	hecks	,			Capacit	y Che	ecks	,		
	Actual	С	apacity	LOS F?			Actual	Ca	pacity	LOS F
					V <sub>F</sub>		1945	Exhibit 13-8	4500	No
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$	- V <sub>D</sub>	1618	Exhibit 13-8	4500	No
10					V <sub>R</sub>	- 1	327	Exhibit 13-1		No
Joy Entor	ring Merge li	nfluonoo A	roo		_	torin		rge Influen		110
TOW LINE	Actual		Desirable	Violation?	FIOW EI	_	Actual	Max Desirab		Violation
V <sub>R12</sub>	7 totadi	Exhibit 13-8	Sconable	VIOIGUOTT:	V <sub>12</sub>	$\overline{}$	945	Exhibit 13-8	4400:All	No
	ervice Deteri		f not E		+			termination		
										<i>r)</i>
	+ 0.00734 v <sub>R</sub> +	0.0078 V <sub>12</sub> -	0.00627 L <sub>A</sub>					.0086 V <sub>12</sub> - 0.0	009 LD	
R = (pc/m					l ''	6.9 (pc/	,			
` .	bit 13-2)				-	`	oit 13-2)			
Speed Det	ermination				Speed L	Deter	minatio	on		
1 <sub>S</sub> = (Exib	it 13-11)			<u> </u>	$D_s = 0.$	327 (E	xhibit 13-	-12)		
						S <sub>R</sub> = 50.7 mph (Exhibit 13-12)				
<sub>R</sub> = mph (					$S_0 = N_0$	/A mph	(Exhibit	13-12)		
$t_{R} = mph (l)$	Exhibit 13-11) Exhibit 13-13)						(Exhibit (Exhibit			

F-4111

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	6015-52 On	26 EB Off to 526 EB
Date Performed	7/25/2014		Jurisdiction	On	
Analysis Time Period	AM Peak		Analysis Year	2018 Βι Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			es.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	1814	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 6	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		, , a la /la	General Terrain:	Level	
DDHV = AADTXKXD		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments				
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.971	
Speed Inputs			Calc Speed Adj and		
Lane Width		ft	<u> </u>		
Rt-Side Lat. Clearance		ft	f <sub>LW</sub>		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	55.0	mph	FFS	55.0	·
Base free-flow Speed,		mph	IFF3	55.0	mph
BFFS			<b>5</b> 1 (1)		
LOS and Performanc	e Measures	<u> </u>	Design (N)		
Operational (LOS)			Design (N)		
$v_p = (V \text{ or DDHV}) / (PHF x I)$	N x f <sub>Liv</sub>		Design LOS		
x f <sub>p</sub> )	<sup>⊓</sup> 1038	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	pc/h/ln
S	55.0	mph	x f <sub>p</sub> )		•
$D = v_p / S$	18.9	pc/mi/ln	S		mph
Los	С	'	$D = v_p / S$		pc/mi/ln
			Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens	-	E <sub>T</sub> - Exhibits 11-10, 11-11,		f <sub>IC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate		e-flow speed	f <sub>n</sub> - Page 11-18		TRD - Page 11-11
LOS - Level of service speed	BFFS - Ba	ase free-flow	LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	. 3
DDHV - Directional design	hour volume		11-3	,	
			1		

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
			0:4- 1-5		
General Information	AJR		Site Information Highway/Direction of Trave	1110 17 0	20
Analyst	-		<b>5</b> .		26 EB Off to 526 EB
Agency or Company	Atkins		From/To	On	
Date Performed	7/25/2014		Jurisdiction	2019 Di	ıild - River Center
Analysis Time Period	PM Peak		Analysis Year	Site	ilia - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plar	nning Data
Flow Inputs					
Volume, V	1426	veh/h	Peak-Hour Factor, PHF	0.90	
AADT		veh/day	%Trucks and Buses, P <sub>T</sub>	4	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length	Level mi	
DDITV - AADT XIXX		VCII/II	Up/Down %	1111	
Calculate Flow Adjus	tments				
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] 0.980	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f <sub>LW</sub>		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	55.0	mph	FFS	55.0	mph
Base free-flow Speed,		mph		33.0	тірп
BFFS					
LOS and Performanc	e Measures	<u> </u>	Design (N)		
Operational (LOS)			Design (N)		
v <sub>p</sub> = (V or DDHV) / (PHF x I	N x f		Design LOS		
x f )	**************************************	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	$N \times f_{HV}$	pc/h/ln
x f <sub>p</sub> ) S	55.0	mph	x f <sub>p</sub> )		ролип
		-	S		mph
$D = v_p / S$	14.7	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	В		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed	E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens	sity	$E_{\rm T}$ - Exhibits 11-10, 11-11,		f <sub>LC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate	FFS - Free	e-flow speed	1 '		TRD - Page 11-11
LOS - Level of service	BFFS - Ba	ase free-flow	f <sub>p</sub> - Page 11-18	11 2	IND - Fage 11-11
speed	haur vale		LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-∠,	
DDHV - Directional design	nour volume		1		

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Navy Base ICTF

0	1		REEWAY	WEAV			I		
General	Informati	on			Site Info	rmation			
Analyst Agency/Con Date Perforr Analysis Tin	med	AJR Atkins 7/25/20 AM Pe			Freeway/Dir of Travel US-17 SB  Weaving Segment Location Off  Analysis Year 2018 Build - River Center Si				
	cription Navy B	ase ICTF							
Weaving se	nfiguration mber of lanes, N gment length, L e-flow speed, F	S		One-Sided 4 650ft 45 mph	Segment typ Freeway min Freeway max	imum speed			C-D Roadwa Multilan Highway 1 225
		<i>.</i>		1141	Terrain type				Leve
Convers	V (veh/h)	C/h Unde PHF	r Base Co	RV (%)	E <sub>T</sub>	E <sub>R</sub>	f	fp	\( \( \no \lambda \)
./	1425	0.90	6	` ′	1.5	1.2	f <sub>HV</sub> 0.971	1.00	v (pc/h) 1631
V <sub>FF</sub>	832	0.90	13	0	1.5	1.2	0.939	1.00	985
/ <sub>RF</sub>	389	0.90	12		1.5	1.2	0.939	1.00	458
/ <sub>FR</sub>	228	0.90	13	0	1.5	1.2	0.939	1.00	270
V <sub>RR</sub>	1901	0.90	13	U	1.5	1.2	0.939	V =	3344
/ <sub>NW</sub>	1443	+						V -	3344
V <sub>W</sub> VR	0.432	+							
	ration Ch	ı aracteris	tics						
	aneuver lanes,			3 lc	Minimum we	eaving lane cl	hanges, LC <sub>MIN</sub>		985 lc/
	density, ID	· ·VVL		0.3 int/mi	Weaving lan	_	- 101114		1129 lc/
•	F lane changes	, LC <sub>RF</sub>		1 lc/pc	Non-weaving	•	**		0 lc/
Minimum FF	R lane changes	, LC <sub>FR</sub>		0 lc/pc	Total lane ch				1129 lc/
Minimum RI	R lane changes	, LC <sub>RR</sub>			Non-weaving				3
Weaving	g Segmen	t Speed,	Density, I	_evel of	Service,	and Cap	pacity		
•	gment flow rate			3344 pc/h 7305 veh/h	1 -	ensity factor, gment speed			0.34 35.3 mp
Weaving se	gment v/c ratio			0.444	Average wea	aving speed,	$S_W$		37.2 mp
•	gment density,	D	23	3.7 pc/mi/ln	Average non				33.9 mp
Level of Ser	rvice, LOS			В	Maximum we	eaving length	n, L <sub>MAX</sub>		5471
Chapter 13, "	egments longer t Freeway Merge a es that exceed the	and Diverge Se	egments".	-		solated merge	and diverge are	eas using the	procedures of

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Navy Base ICTF

			REEWA	WEAV			Γ		
Genera	al Informati	on			Site Info	rmation			
•		AJR Atkins 7/25/20 PM Pe			Freeway/Dir of Travel  Weaving Segment Location  Analysis Year  US-17 SB 6020-I-526 EB On to Bowma Off 2018 Build - River Center Si				
Inputs	Sonption Wavy Di	400 1011							
Weaving c Weaving n Weaving s Freeway fr	onfiguration umber of lanes, N egment length, L ee-flow speed, Fl	S FS		45 mph	Segment typ Freeway min Freeway max Terrain type	imum speed,			C-D Roadway Multilan Highway 1 225 Leve
Conve	rsions to po	T .	II.	1				Ι.,	1 , "
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	f <sub>HV</sub>	fp	v (pc/h)
V <sub>FF</sub>	1052	0.90	4	0	1.5	1.2	0.980	1.00	1192
V <sub>RF</sub>	767	0.90	11	0	1.5	1.2	0.948	1.00	899
$V_{FR}$	374	0.90	10	0	1.5	1.2	0.952	1.00	436
$V_{RR}$	272	0.90	11	0	1.5	1.2	0.948	1.00	319
$V_{NW}$	1511							V =	2846
V <sub>W</sub>	1335								
VR	0.469								
Config	uration Cha	aracteris	tics		1				
Minimum ı	maneuver lanes,	$N_{WL}$		3 lc		•	nanges, LC <sub>MIN</sub>		899 lc/h
_	ge density, ID			0.3 int/mi	Weaving lan	_	**		1043 lc/h
	RF lane changes,	IXI		1 lc/pc	Non-weaving	-			0 lc/h
	FR lane changes,	111		0 lc/pc	Total lane ch	nanges, LC <sub>ALI</sub>	-		1043 lc/h
Minimum I	RR lane changes	, LC <sub>RR</sub>		lc/pc	Non-weaving	g vehicle inde	ex, I <sub>NW</sub>		29
Weavir	ng Segmen	t Speed,	Density, I	Level of	Service,	and Cap	acity		
Weaving s	segment flow rate	, V		2846 pc/h		ensity factor,			0.328
Weaving s	segment capacity	, C <sub>W</sub>		7247 veh/h	1 '	gment speed,			36.2 mph
	segment v/c ratio	5		0.385	1	aving speed,	••		37.6 mph
· ·	segment density,	ט	19	9.6 pc/mi/ln	Average non		1111		35.1 mph
	ervice, LOS			В	Maximum we	eaving length	, L <sub>MAX</sub>		5901 f
Chapter 13,	segments longer to "Freeway Merge anes that exceed the	and Diverge Se	egments".			solated merge	and diverge are	eas using the	procedures of

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed	AJR Atkins 7/25/2014 AM Peak		Highway/Direction of Trave From/To Jurisdiction Analysis Year	6025-Bo Bowmai 2018 Bu	owman Off to
Project Description Navy				Site	
✓ Oper.(LOS)	Dase ICTI	Пг	Des.(N)	☐ Plar	nning Data
Flow Inputs			700.(11)		ming Data
Volume, V AADT Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D	2257	veh/h veh/day veh/h	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub> %RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0.90 6 0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub> E <sub>T</sub>	1.00 1.5		$E_R$ $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1.2 )] 0.971	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance Number of Lanes, N Total Ramp Density, TRD FFS (measured) Base free-flow Speed,	2 55.0	ft ramps/mi mph	f <sub>LW</sub> f <sub>LC</sub> TRD Adjustment FFS	55.0	mph mph mph mph
BFFS		mph			
LOS and Performanc  Operational (LOS)  v <sub>p</sub> = (V or DDHV) / (PHF x   x f <sub>p</sub> )  S D = v <sub>p</sub> / S LOS		pc/h/ln mph pc/mi/ln	Design (N)  Design (N)  Design LOS $v_p = (V \text{ or DDHV}) / (PHF \text{ x} \text{ x} f_p)$ S $D = v_p / S$ Required Number of Lanes		pc/h/ln mph pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed DDHV - Directional design	BFFS - Ba		$E_R$ - Exhibits 11-10, 11-12 $E_T$ - Exhibits 11-10, 11-11, $f_p$ - Page 11-18 LOS, S, FFS, $v_p$ - Exhibits 11-3	11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed Analysis Time Period	AJR Atkins 7/25/2014 PM Peak		Highway/Direction of Trave From/To Jurisdiction Analysis Year	6025-Bo Bowma	owman Off to
Project Description Navy	Base ICTF			<u> </u>	
✓ Oper.(LOS)			Pes.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D	1819	veh/h veh/day veh/h	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub> %RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0.90 4 0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub> E <sub>T</sub>	1.00 1.5		$E_R$ $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1.2 1)] 0.980	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance Number of Lanes, N	2	ft	f <sub>LW</sub>		mph
Total Ramp Density, TRD	_	ramps/mi	f <sub>LC</sub> TRD Adjustment		mph mph
FFS (measured) Base free-flow Speed, BFFS	55.0	mph mph	FFS	55.0	mph
LOS and Performanc	e Measures	<b>3</b>	Design (N)		
Operational (LOS)  v <sub>p</sub> = (V or DDHV) / (PHF x l x f <sub>p</sub> ) S D = v <sub>p</sub> / S LOS	N x f <sub>HV</sub> 1031 55.0 18.7 C	pc/h/ln mph pc/mi/ln	Design (N) Design LOS $v_p = (V \text{ or DDHV}) / (PHF \text{ x} \text{ x } f_p)$ S $D = v_p / S$ Required Number of Lanes		pc/h/ln mph pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed DDHV - Directional design	BFFS - Ba		$E_R$ - Exhibits 11-10, 11-12 $E_T$ - Exhibits 11-10, 11-11, $f_p$ - Page 11-18 LOS, S, FFS, $v_p$ - Exhibits 11-3	11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1

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	RA	MPS AND	RAMP JUN	CTIONS W	ORKSHE	ET			
General Inf				Site Infor					
Analyst	AJF	}	Fr	eeway/Dir of Ti		US-17 SB			
Agency or Compa	any Atki	ns	Ju	nction	(	6030-SB On fro	m Bowman		
Date Performed	7/25	5/2014		risdiction					
analysis Time Pe		Peak	Ar	nalysis Year		2018 Build - Riv	er Center Site		
	on Navy Base IC	CTF							
nputs		1							
Jpstream Adj Ra	ımp	1	ber of Lanes, N	2				Downstre	eam Adj
		Ramp Number	r of Lanes, N	1				Ramp	
Yes	On	Acceleration L	ane Length, L <sub>A</sub>	900				□Yes	On
✓ No	Off	Deceleration L	ane Length L <sub>D</sub>						_
<u>. 140                                   </u>	Oli	Freeway Volu	me, V <sub>E</sub>	2257				☑ No	Off
<sub>rup</sub> = ft		Ramp Volume	'	713				L <sub>down</sub> =	ft
up.			Flow Speed, S <sub>FF</sub>	55.0					
$v_{\rm u}$ = ve	h/h	1	ow Speed, S <sub>FR</sub>	45.0				$V_D =$	veh/h
<u> </u>	//-      -		111	45.0					
onversioi	n to pc/h Un	der Base (	Sonaitions	1	1	1			
(pc/h)	(Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	f <sub>p</sub>	v = V/PH	$F x f_{HV} x f_{p}$
Freeway	2257	0.90	Level	6	0	0.971	1.00		2583
Ramp	713	0.90	Level	2	0	0.990	1.00		800
JpStream									
DownStream									
		Merge Areas					Diverge Areas		
stimation	of v <sub>12</sub>				Estimati	on of v <sub>12</sub>			
	V <sub>12</sub> = V <sub>1</sub>	( P <sub>EM</sub> )				V <sub>12</sub> :	= V <sub>R</sub> + (V <sub>F</sub> - V <sub>I</sub>	<sub>B</sub> )P <sub>ED</sub>	
EQ =		uation 13-6 or	13-7)		L <sub>EQ</sub> =	12	(Equation 13		13)
P <sub>FM</sub> =			ion (Exhibit 13-6)		P <sub>FD</sub> =		using Equation		
' <sub>12</sub> =	2583		ion (Exhibit 10 0)		V <sub>12</sub> =		pc/h	OII (EXIIIDIC I	0-1)
		•	10 44 40 47)				•	12 14 12	17)
/ <sub>3</sub> or V <sub>av34</sub>			13-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>	> 0.700/I-0	pc/h (Equation		17)
	2,700 pc/h? Y					•	☐Yes ☐ No		
	1.5 * V <sub>12</sub> /2		10 10 10		Is V <sub>3</sub> or V <sub>av3</sub>	<sub>4</sub> > 1.5 ^ V <sub>12</sub> /2	☐Yes ☐ No		10.40
Yes,V <sub>12a</sub> =	pc/n 13-19		s-16, 13-18, or		If Yes,V <sub>12a</sub> =		pc/h (Equation 13-19)	on 13-16, 1	13-18, or
Capacity C		· /			Capacity	/ Checks	10 10)		
ларастој с	Actual	C	apacity	LOS F?		Actua	al Ca	apacity	LOS F?
	7.000	† Ť	эрээн		V <sub>F</sub>		Exhibit 13		
.,						\/	Exhibit 13	_	
$V_{FO}$	3383	Exhibit 13-8		No	$V_{FO} = V_{F}$	V R	Exhibit 13		
					$V_R$		10	o-	
low Enter	ing Merge I	nfluence A	rea		Flow En	terina Div	erge Influe	nce Area	<u>'</u>
	Actual		Desirable	Violation?	1	Actual	Max Des		Violation?
V <sub>R12</sub>	3383	Exhibit 13-8	4600:AII	No	V <sub>12</sub>		Exhibit 13-8		
	ervice Deter					Service D	etermination	on (if no	t F)
	75 + 0.00734 v <sub>R</sub> +						0.0086 V <sub>12</sub> - 0		,
		0.0010 v <sub>12</sub> - 0.0			1	• •	0.0000 v <sub>12</sub> - 0	LD	
	oc/mi/ln)				"	c/mi/ln)			
	ibit 13-2)					xhibit 13-2)			
Speed Dete	ermination				<del>                                     </del>	eterminat	ion		
M <sub>S</sub> = 0.355 (	(Exibit 13-11)				$D_s = (E_s)$	xhibit 13-12)			
	iph (Exhibit 13-11)	)			S <sub>R</sub> = mp	oh (Exhibit 13-1	2)		
13						$S_0$ = mph (Exhibit 13-12)			
5 = 50.4 m	ph (Exhibit 13-11) ph (Exhibit 13-13)				S = mph (Exhibit 13-13)				
	niversity of Florida,		ed			•		Senerated: 1	2/9/2014 11:0
yrignt © 2012 U	inversity of Florida,	All Rights Reserv	eu		HCS2010 <sup>TM</sup>	Version 6.41	(	senerated: 12	2/9/2014 11:0

	RA	MPS AND	RAMP JUN	CTIONS W	ORKSH	EET				
General Infor				Site Infor						
Analyst	AJR		Fr	eeway/Dir of Tr	avel	US-17	SB			
Agency or Company				nction		6030-8	BB On from	Bowman		
Date Performed		/2014		risdiction						
nalysis Time Period			Ar	nalysis Year		2018 E	Build - River	Center Site		
roject Description	Navy Base IC	I F								
-		Erooway Num	ber of Lanes, N	2					T	
Ipstream Adj Ramp		1							Downstre	am Adj
☐Yes ☐ Or	1	Ramp Number		1					Ramp	
_ 103 _ 01	•	1	ane Length, L <sub>A</sub>	900					□Yes	On
☑ No ☐ Of	f	1	ane Length L <sub>D</sub>						✓ No	Off
		Freeway Volui	me, V <sub>F</sub>	1819					1.	
<sub>ip</sub> = ft		Ramp Volume	, V <sub>R</sub>	727					L <sub>down</sub> =	ft
		Freeway Free-	Flow Speed, S <sub>FF</sub>	55.0					V <sub>D</sub> =	veh/h
u = veh/h	1	Ramp Free-Fl	ow Speed, S <sub>FR</sub>	45.0					V <sub>D</sub> -	VEII/II
conversion t	o pc/h Un		111							
(pc/h)	V	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	fp	v = V/PHF	$= x f_{HV} x f_{n}$
reeway	(Veh/hr) 1819	0.90	Level	4	0	<u> </u>	980	1.00		2062
Ramp	727	0.90	Level	2	0	_	990	1.00	-	816
JpStream	121	0.30	Level		<del>                                     </del>	╁	.550	1.00	<del>                                     </del>	010
DownStream		† †				+				
		Merge Areas		•			Ď	iverge Areas	*	
stimation o	f v <sub>12</sub>				Estimat	ion c	of v <sub>12</sub>			
	V <sub>12</sub> = V <sub>F</sub>	(P <sub>rw</sub> )					V <sub>40</sub> = \	/ <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>	)P <sub>E</sub> D	
EQ =		ation 13-6 or	13-7)		  =			Equation 13		3)
			ion (Exhibit 13-6)		L <sub>EQ</sub> = P =			ising Equation		
FM =	2062		IOIT (EXIIIDIL 13-0)		P <sub>FD</sub> =			oc/h	OII (EXIIIDIL I	J-1)
12 =		•	10 11 10 17		V <sub>12</sub> =				40 44 40 4	<b>7</b> \
or V <sub>av34</sub>			13-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>	. 0 -		oc/h (Equation		7)
s $V_3$ or $V_{av34} > 2,70$								Yes No		
s V <sub>3</sub> or V <sub>av34</sub> > 1.5			10 10 10		1			]Yes ☐ No		0.40
Yes,V <sub>12a</sub> =	pc/n 13-19)		3-16, 13-18, or		If Yes,V <sub>12a</sub> =	=		oc/h (Equatio 3-19)	on 13-16, 1	3-18, or
Capacity Che		<u>'</u>			Capacit	y Ch		,		
	Actual	C	apacity	LOS F?			Actual	Ca	pacity	LOS F?
					V <sub>F</sub>			Exhibit 13-	-8	
$V_{FO}$	2878	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>		Exhibit 13-	-8	
- FO	2010	Extribit 10 0						Exhibit 13	3-	
					V <sub>R</sub>			10		
low Entering				1 10 0	Flow Er			ge Influer		
	Actual		Desirable 4600-All	Violation?	\/	+	Actual	Max Des	sirable T	Violation
	2878	Exhibit 13-8	4600:All	No	V <sub>12</sub>	<u> </u>		Exhibit 13-8	(:5 1	
V <sub>R12</sub>		nınatıon (ı						terminatio	<u> </u>	<i>F)</i>
evel of Serv						$D_R = 4$	1.252 + 0.	0086 V <sub>12</sub> - 0	).009 L <sub>D</sub>	
.evel of Serv D <sub>R</sub> = 5.475 +	0.00734 v <sub>R</sub> + (	0.0078 V <sub>12</sub> - 0.0	00627 L <sub>A</sub>		1					
evel of Serv $D_R = 5.475 + 21.9 \text{ (pc/m}$	0.00734 v <sub>R</sub> + ( ni/ln)	0.0078 V <sub>12</sub> - 0.0	00627 L <sub>A</sub>		D <sub>R</sub> = (p	oc/mi/l	,			
evel of Serv $D_R = 5.475 + 21.9 \text{ (pc/m}$	0.00734 v <sub>R</sub> + ( ni/ln)	0.0078 V <sub>12</sub> - 0.0	00627 L <sub>A</sub>		D <sub>R</sub> = (p		n) : 13-2)			
Level of Serv $D_R = 5.475 + 21.9 \text{ (pc/m}$	0.00734 v <sub>R</sub> + ( ni/ln) 13-2)	0.0078 V <sub>12</sub> - 0.0	00627 L <sub>A</sub>		D <sub>R</sub> = (p	Exhibi	13-2)	n		
D <sub>R</sub> = 5.475 +  R = 21.9 (pc/m  OS = C (Exhibit  Speed Deterr	0.00734 v <sub>R</sub> + ( ni/ln) 13-2) <b>mination</b>	0.0078 V <sub>12</sub> - 0.0	00627 L <sub>A</sub>		D <sub>R</sub> = (p LOS = (E <b>Speed L</b>	Exhibi	13-2) <b>minatio</b>	n		
D <sub>R</sub> = 5.475 + R = 21.9 (pc/m OS = C (Exhibit Speed Deterr S = 0.309 (Exi	0.00734 v <sub>R</sub> + 0 ni/ln) 13-2) <b>mination</b> bit 13-11)	0.0078 V <sub>12</sub> - 0.0	00627 L <sub>A</sub>		D <sub>R</sub> = (p LOS = (E <b>Speed L</b> D <sub>s</sub> = (E	Exhibit <b>Deter</b> Exhibit	13-2) <b>minatio</b>	n		
D <sub>R</sub> = 5.475 +  R = 21.9 (pc/m  OS = C (Exhibit  Speed Deterr  S = 0.309 (Exi  R = 51.0 mph	0.00734 v <sub>R</sub> + 0 ni/ln) 13-2) <b>mination</b> bit 13-11) (Exhibit 13-11)	0.0078 V <sub>12</sub> - 0.0	00627 L <sub>A</sub>		$D_R = (p)$ $LOS = (E)$ $Speed L$ $D_S = (E)$ $S_R = m$	Exhibit  Deter  Exhibit  nph (Ex	13-2) minatio 3-12) hibit 13-12)	n		
D <sub>R</sub> = 5.475 + D <sub>R</sub> = 21.9 (pc/m OS = C (Exhibit  Speed Deterr D <sub>S</sub> = 0.309 (Exi D <sub>R</sub> = 51.0 mph D <sub>O</sub> = N/A mph (	0.00734 v <sub>R</sub> + 0 ni/ln) 13-2) <b>mination</b> bit 13-11)	0.0078 V <sub>12</sub> - 0.0	00627 L <sub>A</sub>		$D_R$ = (property of the property of the prop	Exhibit  Exhibit  The ph (Exhibit (Exhibit)  The ph (Exhibit)	13-2) minatio 3-12)	n		

			WPS AND	RAMP JUN			== 1			
Genera	l Inforr	nation			Site Infor	mation				
Analyst		AJR		Fr	eeway/Dir of Tr	avel	US-17 SB			
Agency or C		Atkin			ınction		6035-SB On fro	m Wingo Way		
ate Perfor		4/25/			ırisdiction					
nalysis Tir		AM F		Ar	nalysis Year		2018 Build - Riv	er Center Site		
	cription	Navy Base ICT	F							
nputs			L						1	
Jpstream A	Adj Ramp			er of Lanes, N	2				Downstre	am Adj
٦.,			Ramp Number	of Lanes, N	1				Ramp	
Yes	∐On		Acceleration La	ane Length, L <sub>A</sub>	875				□Yes	On
✓ No	Off		Deceleration L	ane Length L <sub>D</sub>						
Y INO			Freeway Volur	ne, V <sub>r</sub>	2284				✓ No	Off
up =	ft		Ramp Volume	'	779				L <sub>down</sub> =	ft
ир			1	Flow Speed, S <sub>FF</sub>	55.0					
' <sub>u</sub> =	veh/h		1						$V_D =$	veh/h
			Ramp Free-Flo	111	45.0					
onver	sion to		der Base (	Conditions	1	1	1	_	1	
(pc/	h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	$f_{HV}$	f <sub>p</sub>	V = V/PHI	x f <sub>HV</sub> x f <sub>p</sub>
reeway		2284	0.90	Level	3	0	0.985	1.00		2576
Ramp		779	0.90	Level	2	0	0.990	1.00		874
JpStream		113	0.30	Level	2	0	0.550	1.00		014
DownStrea	am									
			Merge Areas					Diverge Areas		
stimat	tion of	V <sub>12</sub>				Estimati	ion of v <sub>12</sub>	_		
		V <sub>12</sub> = V <sub>F</sub>	(P )				<u>:=</u> _	= V <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>	\P	
_				10.7\			<b>v</b> 12	(Equation 13		2)
EQ =			ation 13-6 or			- <sub>EQ</sub> =				
<sub>FM</sub> =				on (Exhibit 13-6)		P <sub>FD</sub> =		using Equation	on (Exhibit 1	3-7)
12 =		2576				V <sub>12</sub> =		pc/h		
$_3'$ or $V_{av34}$				3-14 or 13-17)	)	$V_3$ or $V_{av34}$		pc/h (Equation		17)
		) pc/h? Ye:				Is V <sub>3</sub> or V <sub>av3</sub>	<sub>34</sub> > 2,700 pc/h?	☐Yes ☐ No		
s V <sub>3</sub> or V <sub>av</sub>	<sub>v34</sub> > 1.5 *	V <sub>12</sub> /2 □ Ye	s 🗹 No			Is V <sub>3</sub> or V <sub>av3</sub>	$_{34} > 1.5 * V_{12}/2$	☐ Yes ☐ No		
Yes,V <sub>12a</sub>	=			-16, 13-18, or		If Yes,V <sub>12a</sub> =		pc/h (Equation	n 13-16, 1	3-18, or
		13-19)						13-19)		
apacıı	ty Che		1 0		1 100 50	Capacity	y Checks		**	1 .00 50
		Actual	C	apacity	LOS F?		Actua		pacity	LOS F?
						V <sub>F</sub>		Exhibit 13-	-8	
V <sub>F</sub>	.	3450	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>	Exhibit 13-	-8	
·	Ŭ					V <sub>R</sub>		Exhibit 13	3-	
			<u> </u>				<u> </u>	10		
low E	ntering		fluence A		1 15 1 5 0	Flow En	<del></del>	erge Influer		
		Actual		Desirable	Violation?	\	Actual	Max Des	sirable T	Violation
V <sub>R1</sub>		3450	Exhibit 13-8	4600:All	No	V <sub>12</sub>		Exhibit 13-8		<u> </u>
			nination (i			+		eterminatio		<i>F</i> )
D <sub>R</sub> =	= 5.475 + (	0.00734 v <sub>R</sub> + (	0.0078 V <sub>12</sub> - 0.0	0627 L <sub>A</sub>		[	$D_{R} = 4.252 +$	0.0086 V <sub>12</sub> - 0	0.009 L <sub>D</sub>	
<sub>R</sub> = 2	6.5 (pc/mi	/ln)				$D_R = (p$	c/mi/ln)			
	C (Exhibit 1	3-2)				1	xhibit 13-2)			
		ination				<u> </u>	eterminat	ion		
•						<del></del>	xhibit 13-12)			
•	.365 (Exib						•	٥١		
						S <sub>R</sub> = mph (Exhibit 13-12)				
•		xhibit 13-11)				ľ	oh (Exhibit 13-12			
= 5						S = mp	ph (Exhibit 13-13	3)		
								<u> </u>		

	RA	MPS AND	RAMP JUN	CTIONS W	/ORKSHI	EET				
General Inf				Site Infor		<u></u>				
Analyst	AJR		Fr	eeway/Dir of Ti		US-17 SB				
Agency or Compa	any Atkin	S	Ju	nction		6035-SB C	n from W	ingo Way		
ate Performed	7/25/	2014		risdiction						
Analysis Time Pe			Ar	nalysis Year		2018 Build	- River C	enter Site		
	on Navy Base IC	ΓF								
nputs		1								
Jpstream Adj Ra	mp	1	per of Lanes, N	2					Downstre	am Adj
		Ramp Number	of Lanes, N	1					Ramp	
Yes	On	Acceleration L	ane Length, L <sub>A</sub>	875					□Yes	On
✓ No	Off	Deceleration L	ane Length L <sub>D</sub>							_
<u> </u>	Oli	Freeway Volur	ne, V <sub>E</sub>	2228					✓No	Off
<sub>rup</sub> = ft		Ramp Volume		794					L <sub>down</sub> =	ft
		1	Flow Speed, S <sub>FF</sub>	55.0						
$v_{\rm u} = v_{\rm e}$	h/h	Ramp Free-Flo		45.0					$V_D =$	veh/h
2	- 4/b II		111	45.0						
onversior	n to pc/h Un		onaitions	1	1	1				
(pc/h)	(Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>H\</sub>	·	f <sub>p</sub>	v = V/PHI	$F x f_{HV} x f_{p}$
Freeway	2228	0.90	Level	2	0	0.990		1.00		2500
Ramp	794	0.90	Level	2	0	0.990		1.00		891
JpStream										
DownStream										
		Merge Areas			<u> </u>		Div	erge Areas		
stimation	of v <sub>12</sub>				Estimati	ion of v	12			
	V <sub>12</sub> = V <sub>F</sub>	(P <sub>FM</sub> )				,	V <sub>12</sub> = V <sub>E</sub>	+ (V <sub>F</sub> - V <sub>R</sub> )	)P <sub>FD</sub>	
- <sub>EQ</sub> =	(Equ	ation 13-6 or	13-7)		L <sub>EQ</sub> =		(E	quation 13-	12 or 13-1	13)
P <sub>FM</sub> =			on (Exhibit 13-6)		P <sub>FD</sub> =			ing Equatio		
' <sub>12</sub> =	2500		(		V <sub>12</sub> =		рс		(	- /
/ <sub>3</sub> or V <sub>av34</sub>		•	3-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>			h (Equation 1	3_14 or 13_	17\
	2,700 pc/h?  Ye		10-14-01-10-17)			> 2 700		Yes No	0 14 01 10	.,,
	1.5 * V <sub>12</sub> /2 □ Ye							Yes □ No		
			-16, 13-18, or					res ∟∷no /h (Equatior	n 13₋16 1	3_18 or
Yes,V <sub>12a</sub> =	13-19		-10, 10-10, 01		If Yes,V <sub>12a</sub> =	:	13-		1 13-10, 1	3-10, OI
Capacity C	hecks				Capacit	y Chec	ks	,		
	Actual	С	apacity	LOS F?			Actual	Сар	acity	LOS F?
					V <sub>F</sub>			Exhibit 13-8	3	
$V_{FO}$	3391	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>D</sub>		Exhibit 13-8	3	
*FO	3331	LAHIDIC 13-0		140		- IX		Exhibit 13-		
					V <sub>R</sub>			10		
low Enter	ing Merge In	fluence A	rea		Flow En	tering	Diverg	e Influen	ce Area	1
	Actual	Max [	Desirable	Violation?		Actu	ıal	Max Desi	rable	Violation?
$V_{R12}$	3391	Exhibit 13-8	4600:AII	No	V <sub>12</sub>		1	Exhibit 13-8		
evel of Se	rvice Deterr	nination (i	f not F)		Level of	Servic	e Dete	rminatio	n (if not	F)
D <sub>R</sub> = 5.47	75 + 0.00734 v <sub>R</sub> + 0	0.0078 V <sub>12</sub> - 0.0	0627 L <sub>Δ</sub>			D <sub>R</sub> = 4.2	52 + 0.0	086 V <sub>12</sub> - 0.	009 L <sub>D</sub>	
) <sub>R</sub> = 26.0 (p		12	^		L	oc/mi/ln)		12	D	
	ibit 13-2)				1	Exhibit 13	-2)			
	· · · · · · · · · · · · · · · · · · ·							1		
_	ermination				Speed L					
	(Exibit 13-11)				l °	xhibit 13-1	-			
11	= 50.3 mph (Exhibit 13-11)					S <sub>R</sub> = mph (Exhibit 13-12)				
						S <sub>0</sub> = mph (Exhibit 13-12)				
5 = 50.3 m	ph (Exhibit 13-13)				S = m	ph (Exhibit	13-13)			
	niversity of Florida, A		HCS2010 <sup>TM</sup>	Varaian 6	11	Ge	enerated: 12	2/9/2014 11:09		

## **MAJOR MERGE SEGMENTS ANALYSIS**

# **ATKINS**

### General Information

Date Performed: Analysis Year 7/25/2014 2018 Build-River Center Site AM Peak Freeway/Direction
Junction
Segment ID

US 17 SB From SC-703 6040

Analysis Time Period: Project Description:

Navy Base ICTF

## Inputs

	Freeway Upstream of On-Ramp	Freeway Downstream of On-Ramp	On-Ramp
Number of Lanes, N	2	4	2
Free-Flow Speed, FFS (mph)	55	55	40
Volume, V (veh/h)	3,063	4,368	1,305
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	2%	4%	6%
%RVs, P <sub>R</sub>	0%	0%	0%

## Performance Measures

	Freeway Upstream of On-Ramp	Freeway Downstream of On-Ramp	On-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.99	0.98	0.97
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	1,719	1,238	747
Capacity Flow Rate, c (pc/h/ln)	2,250	2,250	2,000
v/c ratio	0.76	0.55	0.37
	Below Capacity	Below Capacity	Below Capacity

## Formulas and Reference Material

$$f_{HV} = \frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$
 HCM 2010, Equation 11-3  
 $V_p = \frac{V}{PHF^*N^*f_{HV}^*f_P}$  HCM 2010, Equation 11-2

Basic Freeway Segments Max Service Flow Rates

	0
FFS (mi/h)	Capacity (pc/h/ln)
75	2,400
70	2,400
65	2,350
60	2,300
55	2,250

Source: HCM 2010, Exhibit 11-17

#### Ramp Roadways Max Service Flow Rates

FFS (mi/h)	Capacity (pc/h/ln)
> 50	2,200
>40-50	2,100
>30-40	2,000
≥20-30	1,900
<20	1,800

## **MAJOR MERGE SEGMENTS ANALYSIS**

# **ATKINS**

### **General Information**

Date Performed: Analysis Year 7/25/2014 2018 Build-River Center Site PM Peak Freeway/Direction Junction Segment ID US 17 SB From SC-703 6040

Analysis Time Period: Project Description:

Navy Base ICTF

### Inputs

	Freeway	Freeway	
	Upstream of	Downstream of	
	On-Ramp	On-Ramp	On-Ramp
Number of Lanes, N	2	4	2
Free-Flow Speed, FFS (mph)	55	55	40
Volume, V (veh/h)	3,022	4,186	1,164
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, $P_T$	2%	3%	6%
%RVs, P <sub>R</sub>	0%	0%	0%

## Performance Measures

	Freeway Upstream of On-Ramp	Freeway Downstream of On-Ramp	On-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.99	0.99	0.97
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	1,696	1,180	666
Capacity Flow Rate, c (pc/h/ln)	2,250	2,250	2,000
v/c ratio	0.75	0.52	0.33
	Below Capacity	Below Capacity	Below Capacity

## Formulas and Reference Material

$$f_{HV} = \frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$
 HCM 2010, Equation 11-3  
 $V_p = \frac{V}{PHF^*N^*f_{HV}^*f_P}$  HCM 2010, Equation 11-2

Basic Freeway Segments Max Service Flow Rates

··· <b>,</b> · · · <b>,</b> · · · <b>,</b> · · ·	9
FFS (mi/h)	Capacity (pc/h/ln)
75	2,400
70	2,400
65	2,350
60	2,300
55	2,250

Source: HCM 2010, Exhibit 11-17

#### Ramp Roadways Max Service Flow Rates

rang radamaje	THE THE THE
FFS (mi/h)	Capacity (pc/h/ln)
> 50	2,200
>40-50	2,100
>30-40	2,000
≥20-30	1,900
<20	1,800

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed	AJR Atkins 7/25/2014		Highway/Direction of Trave From/To Jurisdiction	6045-S	SB C-703 to E Bay uild - River Center
Analysis Time Period	AM Peak		Analysis Year	Site	ilia - River Ceriler
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			es.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	4368	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 4	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1)] 0.980	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f <sub>LW</sub>		mph
Number of Lanes, N	4		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	55.0	mph	FFS	55.0	mph
Base free-flow Speed, BFFS		mph			·
LOS and Performanc	e Measures	3	Design (N)		
Operational (LOS) v <sub>p</sub> = (V or DDHV) / (PHF x I	N x f <sub>HV</sub> 1238	pc/h/ln	Design (N) Design LOS v <sub>p</sub> = (V or DDHV) / (PHF x	N x f <sub>HV</sub>	n a /h /l n
x f <sub>p</sub> ) S	55.0	mnh	x f <sub>p</sub> )		pc/h/ln
D = v <sub>p</sub> / S	22.5	mph pc/mi/ln	S		mph
LOS	C	Politikiii	$D = v_p / S$ Required Number of Lane	o N	pc/mi/ln
Classon				5, IN	
Glossary			Factor Location		
N - Number of lanes V - Hourly volume	S - Spee D - Dens	sity	E <sub>R</sub> - Exhibits 11-10, 11-12 E <sub>T</sub> - Exhibits 11-10, 11-11		f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate LOS - Level of service speed	BFFS - Ba	e-flow speed ase free-flow	f <sub>p</sub> - Page 11-18 LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3		TRD - Page 11-1
DDHV - Directional design	nour volume		1170		

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed	AJR Atkins 7/25/2014		Highway/Direction of Trave From/To Jurisdiction	6045-S	C-703 to E Bay
Analysis Time Period	PM Peak		Analysis Year	Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			es.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	4186	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 3	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1)] 0.985	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f <sub>LW</sub>		mph
Number of Lanes, N	4		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	55.0	mph	FFS	55.0	mph
Base free-flow Speed, BFFS		mph			·
LOS and Performanc	e Measures	5	Design (N)		
Operational (LOS) v <sub>p</sub> = (V or DDHV) / (PHF x I	N x f <sub>HV</sub> 1180	pc/h/ln	Design (N) Design LOS v <sub>p</sub> = (V or DDHV) / (PHF x	N x f <sub>HV</sub>	
x f <sub>p</sub> )	<i>EE</i> 0	mnh	x f <sub>p</sub> )		pc/h/ln
S D = v <sub>p</sub> / S	55.0 21.5	mph pc/mi/ln	S		mph
LOS	C C	ροπιπ	$D = v_p / S$		pc/mi/ln
			Required Number of Lane	s, N	
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed	BFFS - Ba		$E_R$ - Exhibits 11-10, 11-12 $E_T$ - Exhibits 11-10, 11-11 $f_p$ - Page 11-18 LOS, S, FFS, $v_p$ - Exhibits 11-3	, 11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1
DDHV - Directional design	nour volume		11-0		

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		RAMP	S AND RAM			RKS	HEET				
General Infor	mation			Site Infor							
Analyst	AJR		Fre	eeway/Dir of Tra	avel	US-17	SB				
Agency or Company				nction		6050-C	Off to Morriso	n			
Date Performed		/2014		risdiction		0040 5	)	2 1 0:1			
Analysis Time Period			An	alysis Year		2018 E	Build - River (	Center Site			
Project Description nputs	Navy base ic	IF									
		Erooway Num	ber of Lanes, N	4							
Upstream Adj R	amp	1 '							Downstre	eam Adj	
□Yes □	On	Ramp Number	,	1					Ramp		
1C3	1011	1	ane Length, L <sub>A</sub>						✓ Yes	On	
✓ No	Off	Deceleration L	ane Length L <sub>D</sub>	200					□No	<b>✓</b> Off	
		Freeway Volu	me, V <sub>F</sub>	4368							
L <sub>up</sub> = fi	t	Ramp Volume	, V <sub>R</sub>	558					L <sub>down</sub> =	885 ft	
V -	- I- /I-	Freeway Free	Flow Speed, S <sub>FF</sub>	55.0					V <sub>D</sub> =	481 veh/h	
$V_u = V_0$	eh/h	Ramp Free-Fl	ow Speed, S <sub>FR</sub>	45.0					D _	401 VEII/I	
Conversion to	o pc/h Uni		110								
	V	PHF		%Truck	%Rv		f	f	v – V/DU	Evf vf	
(pc/h)	(Veh/hr)	PHF	Terrain	70 TTUCK	70F(V	_	f <sub>HV</sub>	f <sub>p</sub>	v – v/Fii	PHF x f <sub>HV</sub> x f <sub>p</sub>	
Freeway	4368	0.90	Level	4	0	0.	.980	1.00		4950	
Ramp	558	0.90	Level	11	0 0.948 1.00		1.00		654		
UpStream						+-					
DownStream	481	0.90	Level	7	0	0.	.966	1.00		553	
=atimatian at		Merge Areas			Fatimati	iono	Di	verge Areas			
Estimation of	V <sub>12</sub>				Estimati	ion c					
	$V_{12} = V_{F}$	(P <sub>FM</sub> )			$V_{12} = V_R + (V_F - V_R)P_{FD}$						
- <sub>EQ</sub> =	(Equa	ation 13-6 or	13-7)		L <sub>EQ</sub> = (Equation 13-12 or 13-13)						
P <sub>FM</sub> =	using	Equation (E	Exhibit 13-6)		P <sub>FD</sub> = 0.436 using Equation (Exhibit 13-7)						
/ <sub>12</sub> =	pc/h				$V_{12} = 2527 \text{ pc/h}$						
/ <sub>3</sub> or V <sub>av34</sub>	pc/h (	Equation 13-	-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub> 1211 pc/h (Equation 13-14 or 13-17)						
Is V <sub>3</sub> or V <sub>av34</sub> > 2,70			,		Is V <sub>3</sub> or V <sub>av34</sub> > 2,700 pc/h? ☐ Yes ☑ No						
Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 '											
			-16, 13-18, or		Is $V_3$ or $V_{av34} > 1.5 * V_{12}/2$ Yes No pc/h (Equation 13-16, 13-18, or 13						
f Yes,V <sub>12a</sub> =	13-19				If Yes,V <sub>12a</sub> =		19		,	-, -	
Capacity Che	cks				Capacity	y Ch	ecks				
	Actual	C	apacity	LOS F?			Actual	Ca	pacity	LOS F?	
					$V_{F}$		4950	Exhibit 13-8	9000	No	
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$	- V <sub>R</sub>	4296	Exhibit 13-8	9000	No	
. 0					V <sub>R</sub>		654	Exhibit 13-1	0 2100	No	
Flow Entering	n Morgo Ir	ofluence A	<u>roa</u>	<u> </u>	-	torir		ge Influen			
10W LINEIIII	Actual		Desirable	Violation?	I IOW LII		Actual	Max Desirab		Violation	
V <sub>R12</sub>	7101441	Exhibit 13-8	3001142510	violation:	V <sub>12</sub>	-	2527	Exhibit 13-8	4400:All		
Level of Serv	ica Dotorr		if not E)					erminatio			
$D_{R} = 5.475 + 0.$		<u> </u>			-			086 V <sub>12</sub> - 0.		<i>( )</i>	
		0.0076 V <sub>12</sub> -	0.00027 L <sub>A</sub>			1.		1000 v <sub>12</sub> - 0.	009 L <sub>D</sub>		
) <sub>R</sub> = (pc/mi/ln	,				l ''		/mi/ln)				
.OS = (Exhibit					-	`	bit 13-2)				
Speed Detern	nination				Speed D	<u> Peter</u>	minatio	1			
$M_{\rm S} = $ (Exibit 13	3-11)				$D_s = 0.3$	357 (E	xhibit 13-1	2)			
	ibit 13-11)				S <sub>R</sub> = 50	).4 mph	(Exhibit 1	3-12)			
					1	) 5 mnh	(Evhihit 1	3_12)			
$S_0 = mph (Exh$	ibit 13-11)				$S_0$ = 59.5 mph (Exhibit 13-12)						
$S_0$ = mph (Exh S = mph (Exh	ibit 13-11) ibit 13-13)				*		(Exhibit 1				

		<u>RAMP</u>	S AND RAM			RKS	HEET				
General Infor	mation			Site Infor							
Analyst	AJR		Fre	eeway/Dir of Tr	avel I	US-17	SB				
Agency or Company	Atkin	iS	Ju	nction	(	6050-C	Off to Morrison	า			
Date Performed		/2014		risdiction							
Analysis Time Period			An	alysis Year		2018 B	uild - River C	enter Site			
Project Description	Navy Base IC	ſF									
nputs									1		
Upstream Adj R	amp	Freeway Num	ber of Lanes, N	4					Downstre	eam Adj	
	7 -	Ramp Numbe	er of Lanes, N	1					Ramp		
□Yes □	On	Acceleration I	_ane Length, L <sub>A</sub>						✓ Yes	On	
✓ No	Off	Deceleration !	Lane Length L <sub>n</sub>	200							
INO L	_ OII	Freeway Volu	5	4186					□ No	✓ Off	
L <sub>up</sub> = f	t	Ramp Volume	'	474					L <sub>down</sub> =	885 ft	
up		1	e-Flow Speed, S <sub>FF</sub>	55.0							
V <sub>11</sub> = Ve	eh/h	1							V <sub>D</sub> =	348 veh/ł	
			low Speed, S <sub>FR</sub>	45.0							
Conversion to	1	der Base	Conditions	-		_			-		
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	$f_p$	v = V/PH	F x f <sub>HV</sub> x f <sub>p</sub>	
Freeway	4186	0.90	Level	3	0	_	985	1.00		4721	
Ramp	474	0.90	Level	11	0 0.948 1.00			-	556		
UpStream	4/4	0.90	Level	11	0	1 0.	340	1.00		330	
DownStream	348	0.90	Level	8	0	0	962	1.00		402	
20miou dam		Merge Areas	20701	U		1 0.		verge Areas		102	
Estimation of					Estimati	ion o	f V <sub>40</sub>				
	- '-	(D )							\D		
	$V_{12} = V_{F}$				$V_{12} = V_R + (V_F - V_R)P_{FD}$						
- <sub>EQ</sub> =		ation 13-6 or			L <sub>EQ</sub> = (Equation 13-12 or 13-13)						
P <sub>FM</sub> =	using	Equation (	Exhibit 13-6)		P <sub>FD</sub> = 0.436 using Equation (Exhibit 13-7)						
/ <sub>12</sub> =	pc/h				V <sub>12</sub> = 2372 pc/h						
/ <sub>3</sub> or V <sub>av34</sub>	pc/h (	Equation 13	-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub> 1174 pc/h (Equation 13-14 or 13-17)						
Is V <sub>3</sub> or V <sub>av34</sub> > 2,70	0 pc/h?	s No			Is $V_3$ or $V_{av34} > 2,700$ pc/h? $\square$ Yes $\blacksquare$ No						
Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 '											
			-16, 13-18, or		Is $V_3$ or $V_{av34} > 1.5 * V_{12}/2$ Yes No pc/h (Equation 13-16, 13-18, or					3-18, or 13-	
f Yes,V <sub>12a</sub> =	13-19				If Yes,V <sub>12a</sub> =		19)	` '			
Capacity Che	cks				Capacity	y Ch	ecks				
	Actual	C	Capacity	LOS F?			Actual	Са	pacity	LOS F?	
					V <sub>F</sub>		4721	Exhibit 13-8	9000	No	
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$	- V <sub>D</sub>	4165	Exhibit 13-8	9000	No	
FO					V <sub>R</sub>	K	556	Exhibit 13-1	+	No	
		- <b>6</b> 1	<b>1</b>		-	4					
		ifiuence A			Flow Entering Diverge Influence Are					Violation?	
Flow Entering	1	Max	Dasirable	\/ialatias2					)I <del>C</del>	violation?	
	Actual		Desirable	Violation?		_	Actual	Max Desirat	ì	NI-	
V <sub>R12</sub>	Actual	Exhibit 13-8		Violation?	V <sub>12</sub>	1	2372	Exhibit 13-8	4400:All	No	
V <sub>R12</sub> Level of Serv	Actual	Exhibit 13-8	if not F)	Violation?	Level of	Ser	2372 vice Dete	Exhibit 13-8 Erminatio	4400:All <b>n (if not</b>		
V <sub>R12</sub>	Actual	Exhibit 13-8	if not F)	Violation?	Level of	Ser	2372 vice Dete	Exhibit 13-8	4400:All <b>n (if not</b>		
V <sub>R12</sub> <b>Level of Serv</b> D <sub>R</sub> = 5.475 + 0.	Actual ice Determ	Exhibit 13-8	if not F)	Violation?	Level of	Serv	2372 vice Dete	Exhibit 13-8 Erminatio	4400:All <b>n (if not</b>		
$V_{R12}$ Level of Serv. $D_R = 5.475 + 0.$ $D_R = (pc/mi/ln)$	Actual  ice Determ 00734 v <sub>R</sub> +	Exhibit 13-8	if not F)	Violation?	Level of  D <sub>R</sub> = 22	<b>Serv</b> D <sub>R</sub> = 4	2372 <b>vice Dete</b> 4.252 + 0.0	Exhibit 13-8 Erminatio	4400:All n (if not		
$V_{R12}$ Level of Serv $D_R = 5.475 + 0.0$ $D_R = (pc/mi/ln)$ $D_R = (Exhibit)$	Actual  ice Detern 00734 v <sub>R</sub> +  13-2)	Exhibit 13-8	if not F)	Violation?	<b>Level of</b> D <sub>R</sub> = 22  LOS = C	Serv D <sub>R</sub> = 4 9.9 (pc (Exhil	2372 vice Dete 1.252 + 0.0 /mi/ln) bit 13-2)	Exhibit 13-8 <b>erminatio</b> 086 V <sub>12</sub> - 0.	4400:All n (if not		
Level of Serv $D_R = 5.475 + 0.$ $D_R = (pc/mi/ln)$ $D_R = (Exhibit)$	Actual ice Determ 00734 v <sub>R</sub> + 1) 13-2) mination	Exhibit 13-8	if not F)	Violation?	Level of  D <sub>R</sub> = 22  LOS = C  Speed D	Serv D <sub>R</sub> = 4 1.9 (pc (Exhil	2372 vice Dete 1.252 + 0.0 /mi/ln) bit 13-2) mination	Exhibit 13-8 <b>erminatio</b> 086 V <sub>12</sub> - 0.	4400:All n (if not		
$V_{R12}$ Level of Serv $D_R = 5.475 + 0.0$ $D_R = (pc/mi/ln)$ $D_R = (Exhibit)$ $D_R = (Exhibit)$ $D_R = (Exhibit)$	Actual  ice Detern 00734 v <sub>R</sub> +  13-2)  mination 3-11)	Exhibit 13-8	if not F)	Violation?	Level of $D_{R} = 22$ $LOS = C$ Speed D $D_{s} = 0.3$	Server 20	2372 vice Dete 1.252 + 0.0 /mi/ln) bit 13-2) mination xhibit 13-1	Exhibit 13-8  ermination 086 V <sub>12</sub> - 0.	4400:All n (if not		
$V_{R12}$ Level of Serv $D_R = 5.475 + 0.0$ $D_R = (pc/mi/ln)$ $D_R = (Exhibit)$	Actual  ice Determ 00734 v <sub>R</sub> +  13-2)  mination 3-11)  nibit 13-11)	Exhibit 13-8	if not F)	Violation?	$\begin{tabular}{c c} $Level of \\ \hline & & & & & & & & \\ \hline & & & & & & \\ D_R = & & & & & \\ LOS = & & & & \\ \hline $LOS = $ & & & \\ \hline $CS = $ & & \\ \hline $D_S = $ & \\ \hline $	Service Servic	2372 vice Dete 1.252 + 0.0 /mi/ln) bit 13-2) mination xhibit 13-1 (Exhibit 13	Exhibit 13-8  ermination 086 V <sub>12</sub> - 0.  1  2) 3-12)	4400:All n (if not		
$V_{R12}$ Level of Serv $D_R = 5.475 + 0.0$ $D_R = (pc/mi/ln)$ $D_R = (Exhibit)$ Speed Determ $D_R = (Exibit)$	Actual  ice Detern 00734 v <sub>R</sub> +  13-2)  mination 3-11)	Exhibit 13-8	if not F)	Violation?	Level of    D <sub>R</sub> = 22   LOS = C     Speed D    D <sub>s</sub> = 0.3   S <sub>R</sub> = 50   S <sub>0</sub> = 59	Service 2.9 (pc (Exhill 2.348 (E ) 1.5 mph ) 2.7 mph	2372 vice Dete 1.252 + 0.0 /mi/ln) bit 13-2) mination xhibit 13-1	Exhibit 13-8 <b>Exmination</b> 086 V <sub>12</sub> - 0.	4400:All n (if not		

#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2018 Build-River Center Site AM Peak Navy Base ICTF Freeway/Direction Junction Segment ID US-17 SB Off to Meeting 6060

Inputs

	Freeway Upstream of Ramp	Freeway Downstream of Ramp	Ramp
Number of Lanes, N	4	3	1
Free-Flow Speed, FFS (mph)	55	55	45
Volume, V (veh/h)	3,810	3,329	481
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	3%	2%	7%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Freeway Upstream Ramp	Freeway Downstream Ramp	Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.99	0.99	0.97
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	1,074	1,245	553
Capacity Flow Rate, c (pc/h/ln)	2,250	2,250	2,100
v/c ratio	0.48	0.55	0.26
Density, D <sub>MD</sub> (pc/mi/ln)	18.8	21.8	9.7
LOS	В	C	Α

# Formulas and Reference Material

 $\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$ 

HCM 2010, Equation 11-3

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V PHF\*N\*f<sub>HV</sub>\*f<sub>P</sub>

HCM 2010, Equation 11-2

 $D_{MD} =$ 

0.0175\*v<sub>f</sub> N

HCM 2010, Equation 13-26

Basic Freeway Segments Max Service Flow Rates

	Capacity
FFS (mi/h)	(pc/h/ln)
75	2,400
70	2,400
65	2,350
60	2,300
55	2,250

Source: HCM 2010, Exhibit 11-17

Ramp Roadways Max Service Flow Rates

	Capacity
FFS (mi/h)	(pc/h/ln)
> 50	2,200
>40-50	2,100
>30-40	2,000
≥20-30	1,900
<20	1,800

Source: HCM 2010, Exhibit 13-10

Diverge LOS Thresholds

	Density
LOS	(pc/mi/ln)
Α	≤10
В	>10-20
С	>20-28
D	>28-35
Е	>35
F	v/c > 1

#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2018 Build-River Center Site PM Peak Navy Base ICTF Freeway/Direction Junction Segment ID US-17 SB Off to Meeting 6060

# Inputs

	Freeway Upstream of Ramp	Freeway Downstream of Ramp	Ramp
Number of Lanes, N	4	3	1
Free-Flow Speed, FFS (mph)	55	55	45
Volume, V (veh/h)	3,712	3,364	348
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	3%	2%	8%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Freeway Upstream Ramp	Freeway Downstream Ramp	Ramp
Heavy Vehicle Adjustment Factor, $f_{\rm HV}$	0.99	0.99	0.96
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	1,047	1,258	402
Capacity Flow Rate, c (pc/h/ln)	2,250	2,250	2,100
v/c ratio	0.47	0.56	0.19
Density, D <sub>MD</sub> (pc/mi/ln)	18.3	22.0	7.0
LOS	В	C	А

# Formulas and Reference Material

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

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HCM 2010, Equation 11-2

 $D_{MD} =$ 

HCM 2010, Equation 13-26

Basic Freeway Segments Max Service Flow Rates

	Capacity
FFS (mi/h)	(pc/h/ln)
75	2,400
70	2,400
65	2,350
60	2,300
55	2,250

Source: HCM 2010, Exhibit 11-17

Ramp Roadways Max Service Flow Rates

	Capacity
FFS (mi/h)	(pc/h/ln)
> 50	2,200
>40-50	2,100
>30-40	2,000
≥20-30	1,900
<20	1,800

Diverge LOS Thresholds

Density

	Density
LOS	(pc/mi/ln)
Α	≤10
В	>10-20
С	>20-28
D	>28-35
Е	>35
F	v/c > 1

Source: HCM 2010, Exhibit 13-10

#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2018 Build-River Center Site AM Peak Navy Base ICTF Freeway/Direction
Junction
Segment ID

US-17 SB Off to I-26 WB 6070

# Inputs

	Freeway Upstream of Ramp	Freeway Downstream of Ramp	Ramp
Number of Lanes, N	3	2	1
Free-Flow Speed, FFS (mph)	55	55	55
Volume, V (veh/h)	3,329	2,198	1,131
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	2%	2%	3%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Freeway Upstream Ramp	Freeway Downstream Ramp	Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.99	0.99	0.99
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	1,245	1,233	1,276
Capacity Flow Rate, c (pc/h/ln)	2,250	2,250	2,200
v/c ratio	0.55	0.55	0.58
Density, D <sub>MD</sub> (pc/mi/ln)	21.8	21.6	22.3
LOS	С	C	С

# Formulas and Reference Material

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

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HCM 2010, Equation 11-2

 $D_{MD} =$ 

HCM 2010, Equation 13-26

Basic Freeway Segments Max Service Flow Rates

	Capacity
FFS (mi/h)	(pc/h/ln)
75	2,400
70	2,400
65	2,350
60	2,300
55	2,250

Source: HCM 2010, Exhibit 11-17

Ramp Roadways Max Service Flow Rates

	Capacity
FFS (mi/h)	(pc/h/ln)
> 50	2,200
>40-50	2,100
>30-40	2,000
≥20-30	1,900
<20	1,800

Diverge LOS Thresholds

	Density
LOS	(pc/mi/ln)
Α	≤10
В	>10-20
С	>20-28
D	>28-35
Е	>35
F	v/c > 1

Source: HCM 2010, Exhibit 13-10

#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2018 Build-River Center Site PM Peak Navy Base ICTF Freeway/Direction Junction Segment ID US-17 SB Off to I-26 WB 6070

# Inputs

	Freeway Upstream of Ramp	Ramp	
Number of Lanes, N	3	2	1
Free-Flow Speed, FFS (mph)	55	55	55
Volume, V (veh/h)	3,364	2,229	1,135
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	2%	2%	2%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Freeway Upstream Ramp	Freeway Downstream Ramp	Ramp
Heavy Vehicle Adjustment Factor, $f_{\rm HV}$	0.99	0.99	0.99
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	1,258	1,251	1,274
Capacity Flow Rate, c (pc/h/ln)	2,250	2,250	2,200
v/c ratio	0.56	0.56	0.58
Density, D <sub>MD</sub> (pc/mi/ln)	22.0	21.9	22.3
LOS	С	C	С

# Formulas and Reference Material

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

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HCM 2010, Equation 11-2

 $D_{MD} =$ 

0.0175\*v<sub>f</sub> N

HCM 2010, Equation 13-26

Basic Freeway Segments Max Service Flow Rates

	Capacity
FFS (mi/h)	(pc/h/ln)
75	2,400
70	2,400
65	2,350
60	2,300
55	2,250

Source: HCM 2010, Exhibit 11-17

Ramp Roadways Max Service Flow Rates

	Capacity
FFS (mi/h)	(pc/h/ln)
> 50	2,200
>40-50	2,100
>30-40	2,000
≥20-30	1,900
<20	1,800

Diverge LOS Thresholds

Density

	Density
LOS	(pc/mi/ln)
Α	≤10
В	>10-20
С	>20-28
D	>28-35
Е	>35
F	v/c > 1

Source: HCM 2010, Exhibit 13-10

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	ሻ	ተተተ	7	7	<b>^</b>	7			7			7
Volume (vph)	155	2611	56	52	2223	60	0	0	76	0	0	61
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0			6.0			6.0
Lane Util. Factor	1.00	0.91	1.00	1.00	0.95	1.00			1.00			1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85			0.86			0.86
Flt Protected		1.00	1.00	0.95	1.00							1.00
Satd. Flow (prot)		5036	1568	1752	3505							1580
Flt Permitted		1.00	1.00	0.95	1.00							1.00
Satd. Flow (perm)	1752	5036	1568	1752	3505	1568			1611			1580
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	172	2901	62	58	2470	67	0	0	84	0	0	68
RTOR Reduction (vph)	0	0	8	0	0	11	0	0	54	0	0	17
Lane Group Flow (vph)	172	2901	54	58	2470	56	0	0	30	0	0	51
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	2%	2%	2%	4%	4%	4%
Turn Type	Prot	NA	Perm	Prot	NA	Perm			Over			Over
Protected Phases	5	2		1	6				1			5
Permitted Phases			2			6			1			5
Actuated Green, G (s)	20.7	147.3	147.3	10.7	137.3	137.3			10.7			20.7
Effective Green, g (s)	20.7	147.3	147.3	10.7	137.3	137.3			10.7			20.7
Actuated g/C Ratio	0.12	0.87	0.87	0.06	0.81	0.81			0.06			0.12
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0			6.0			6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0			3.0			3.0
Lane Grp Cap (vph)	213	4363	1358	110	2830	1266			101			192
v/s Ratio Prot	c0.10	0.58		0.03	c0.70				0.02			0.03
v/s Ratio Perm			0.03			0.04						
v/c Ratio	0.81	0.66	0.04	0.53	0.87	0.04			0.29			0.27
Uniform Delay, d1	72.7	3.6	1.6	77.2	10.7	3.3			76.0			67.8
Progression Factor	1.00	1.00	1.00	0.75	1.89	0.02			1.00			1.00
Incremental Delay, d2	19.6	8.0	0.1	2.2	2.0	0.0			1.6			0.8
Delay (s)	92.4	4.4	1.6	60.4	22.1	0.1			77.7			68.5
Level of Service	F	Α	Α	Е	С	Α			Е			Е
Approach Delay (s)		9.2			22.4			77.7			68.5	
Approach LOS		Α			С			Е			Е	
Intersection Summary												
HCM 2000 Control Delay			16.7	Н	CM 2000	Level of S	Service		В			
HCM 2000 Volume to Capaci	ty ratio		0.86									
Actuated Cycle Length (s)			170.0	S	um of lost	t time (s)			12.0			
Intersection Capacity Utilization	on		80.0%			of Service			D			
Analysis Period (min)			15									
Total Lost time (s) Lane Util. Factor Frt Flt Protected Satd. Flow (prot) Flt Permitted Satd. Flow (perm) Peak-hour factor, PHF Adj. Flow (vph) RTOR Reduction (vph) Lane Group Flow (vph) Heavy Vehicles (%) Turn Type Protected Phases Permitted Phases Actuated Green, G (s) Effective Green, g (s) Actuated g/C Ratio Clearance Time (s) Vehicle Extension (s) Lane Grp Cap (vph) v/s Ratio Prot v/s Ratio Perm v/c Ratio Uniform Delay, d1 Progression Factor Incremental Delay, d2 Delay (s) Level of Service Approach Delay (s) Approach LOS Intersection Summary HCM 2000 Control Delay HCM 2000 Volume to Capaci Actuated Cycle Length (s) Intersection Capacity Utilization	6.0 1.00 1.00 0.95 1752 0.95 1752 0.90 172 0 172 3% Prot 5 20.7 20.7 0.12 6.0 3.0 213 c0.10 0.81 72.7 1.00 19.6 92.4 F	6.0 0.91 1.00 1.00 5036 1.00 5036 0.90 2901 0 2901 3% NA 2 147.3 147.3 0.87 6.0 3.0 4363 0.58 0.66 3.6 1.00 0.88 4.44 A 9.2	6.0 1.00 0.85 1.00 1568 1.00 1568 0.90 62 8 54 3% Perm 2 147.3 147.3 0.87 6.0 3.0 1358 0.03 0.04 1.6 1.00 0.1 1.6 A	6.0 1.00 1.00 0.95 1752 0.95 1752 0.90 58 0 58 3% Prot 1 10.7 10.7 0.06 6.0 3.0 110 0.03 77.2 0.75 2.2 60.4 E	6.0 0.95 1.00 1.00 3505 1.00 3505 0.90 2470 0 2470 3% NA 6 137.3 137.3 0.81 6.0 3.0 2830 c0.70 0.87 10.7 1.89 2.0 22.1 C 22.4 C	6.0 1.00 0.85 1.00 1568 1.00 1568 0.90 67 11 56 3% Perm 6 137.3 137.3 0.81 6.0 3.0 1266 0.04 0.04 3.3 0.02 0.0 0.1 A	0.90 0 0 2%	0.90 0 0 0 2%	6.0 1.00 0.86 1.00 1611 1.00 1611 0.90 84 54 30 2% Over 1 10.7 10.7 0.06 6.0 3.0 101 0.02 0.29 76.0 1.00 1.66 77.7 E	0.90 0 0	0.90 0 0 4%	6. 1.0 0.8 1.0 158 1.0 158 1.0 158 0.9 6 1 5 49 0ve  20. 20. 0.1 6. 3. 19 0.0 0.2 67. 1.0 0. 68.

c Critical Lane Group

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	7	ተተተ	7	7	<b>^</b>	7			7			7
Volume (vph)	115	3007	79	49	2167	40	0	0	76	0	0	61
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0			6.0			6.0
Lane Util. Factor	1.00	0.91	1.00	1.00	0.95	1.00			1.00			1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85			0.86			0.86
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00			1.00			1.00
Satd. Flow (prot)	1770	5085	1583	1770	3539	1583			1611			1580
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00			1.00			1.00
Satd. Flow (perm)	1770	5085	1583	1770	3539	1583			1611			1580
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	128	3341	88	54	2408	44	0	0	84	0	0	68
RTOR Reduction (vph)	0	0	13	0	0	8	0	0	66	0	0	21
Lane Group Flow (vph)	128	3341	75	54	2408	36	0	0	19	0	0	47
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	4%	4%	4%
Turn Type	Prot	NA	Perm	Prot	NA	Perm			Over			Over
Protected Phases	5	2		1	6				1			5
Permitted Phases			2			6			1			5
Actuated Green, G (s)	14.4	119.0	119.0	9.0	113.6	113.6			9.0			14.4
Effective Green, g (s)	14.4	119.0	119.0	9.0	113.6	113.6			9.0			14.4
Actuated g/C Ratio	0.10	0.85	0.85	0.06	0.81	0.81			0.06			0.10
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0			6.0			6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0			3.0			3.0
Lane Grp Cap (vph)	182	4322	1345	113	2871	1284			103			162
v/s Ratio Prot	c0.07	c0.66		0.03	c0.68				0.01			0.03
v/s Ratio Perm			0.05			0.02						
v/c Ratio	0.70	0.77	0.06	0.48	0.84	0.03			0.18			0.29
Uniform Delay, d1	60.7	4.6	1.7	63.2	7.8	2.5			62.0			58.1
Progression Factor	1.00	1.00	1.00	1.09	1.22	0.00			1.00			1.00
Incremental Delay, d2	11.6	1.4	0.1	1.6	1.6	0.0			0.8			1.0
Delay (s)	72.4	6.0	1.7	70.3	11.2	0.0			62.8			59.1
Level of Service	Е	Α	Α	Е	В	Α			Е			Е
Approach Delay (s)		8.3			12.3			62.8			59.1	
Approach LOS		Α			В			Е			Е	
Intersection Summary												
HCM 2000 Control Delay			11.2	Н	CM 2000	Level of S	Service		В			
HCM 2000 Volume to Capa	city ratio		0.83									
Actuated Cycle Length (s)	·		140.0	S	um of lost	t time (s)			12.0			
Intersection Capacity Utiliza	tion		77.4%			of Service			D			
Analysis Period (min)			15									

c Critical Lane Group

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	16.54	<b>^</b>	7	1,1	<b>^</b>	7	7	<b>^</b>	7	ሻ	<b>^</b>	7
Volume (veh/h)	424	1927	336	344	2079	118	171	242	171	58	260	85
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1845	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	471	2141	373	382	2310	131	190	269	190	64	289	94
Adj No. of Lanes	2	3	1	2	3	1	1	2	1	1	2	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	3	3	3	3	3	3	2	2	2	2	2	2
Cap, veh/h	504	2709	1010	421	2587	885	244	529	432	206	332	383
Arrive On Green	0.30	1.00	1.00	0.12	0.51	0.51	0.11	0.15	0.15	0.05	0.09	0.09
Sat Flow, veh/h	3408	5036	1568	3408	5036	1568	1774	3539	1583	1774	3539	1583
Grp Volume(v), veh/h	471	2141	373	382	2310	131	190	269	190	64	289	94
Grp Sat Flow(s),veh/h/ln	1704	1679	1568	1704	1679	1568	1774	1770	1583	1774	1770	1583
Q Serve(g_s), s	22.8	0.0	0.0	18.7	69.8	6.7	16.0	11.9	16.8	5.4	13.7	8.1
Cycle Q Clear(g_c), s	22.8	0.0	0.0	18.7	69.8	6.7	16.0	11.9	16.8	5.4	13.7	8.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	504	2709	1010	421	2587	885	244	529	432	206	332	383
V/C Ratio(X)	0.94	0.79	0.37	0.91	0.89	0.15	0.78	0.51	0.44	0.31	0.87	0.25
Avail Cap(c_a), veh/h	523	2709	1010	442	2587	885	244	529	432	211	334	383
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.70	0.70	0.70	0.31	0.31	0.31	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	58.9	0.0	0.0	73.3	37.0	17.6	59.8	66.3	50.9	64.4	75.8	51.8
Incr Delay (d2), s/veh	18.6	1.7	0.7	8.5	1.7	0.1	14.7	0.8	0.7	0.8	21.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	11.9	0.4	0.2	9.4	32.7	2.9	8.8	5.8	7.4	2.7	7.7	3.6
LnGrp Delay(d),s/veh	77.5	1.7	0.7	81.8	38.8	17.7	74.5	67.1	51.6	65.2	96.8	52.1
LnGrp LOS	E	Α	Α	F	D	В	E	Е	D	Е	F	D
Approach Vol, veh/h		2985			2823			649			447	
Approach Delay, s/veh		13.6			43.6			64.7			82.9	
Approach LOS		В			D			E			F	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	26.9	97.2	24.0	21.9	31.0	93.1	14.6	31.3				
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0				
Max Green Setting (Gmax), s	22.0	90.0	18.0	16.0	26.0	86.0	9.0	25.0				
Max Q Clear Time (g_c+l1), s	20.7	2.0	18.0	15.7	24.8	71.8	7.4	18.8				
Green Ext Time (p_c), s	0.2	83.8	0.0	0.1	0.2	14.0	0.0	2.4				
Intersection Summary												
HCM 2010 Ctrl Delay			35.1									
HCM 2010 LOS			D									

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	1,1	ተተተ	7	1,1	ተተተ	7	7	<b>^</b>	7	7	<b>^</b>	7
Volume (veh/h)	418	2351	314	292	1863	125	217	270	314	114	227	176
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1845	1845	1845	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	464	2612	349	324	2070	139	241	300	349	127	252	196
Adj No. of Lanes	2	3	1	2	3	1	1	2	1	1	2	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	3	3	3	2	2	2	2	2	2
Cap, veh/h	506	2652	973	341	2389	863	260	463	366	226	404	414
Arrive On Green	0.29	1.00	1.00	0.10	0.47	0.47	0.09	0.13	0.13	0.08	0.11	0.11
Sat Flow, veh/h	3442	5085	1583	3408	5036	1568	1774	3539	1583	1774	3539	1583
Grp Volume(v), veh/h	464	2612	349	324	2070	139	241	300	349	127	252	196
Grp Sat Flow(s),veh/h/ln	1721	1695	1583	1704	1679	1568	1774	1770	1583	1774	1770	1583
Q Serve(g_s), s	18.2	0.0	0.0	13.2	51.4	6.1	13.0	11.3	18.3	8.7	9.5	14.6
Cycle Q Clear(g_c), s	18.2	0.0	0.0	13.2	51.4	6.1	13.0	11.3	18.3	8.7	9.5	14.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	506	2652	973	341	2389	863	260	463	366	226	404	414
V/C Ratio(X)	0.92	0.99	0.36	0.95	0.87	0.16	0.93	0.65	0.95	0.56	0.62	0.47
Avail Cap(c_a), veh/h	541	2652	973	341	2389	863	260	463	366	230	404	414
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.55	0.55	0.55	0.41	0.41	0.41	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	48.6	0.0	0.0	62.7	32.8	15.5	54.0	57.8	53.1	49.7	59.1	43.6
Incr Delay (d2), s/veh	12.7	10.0	0.6	20.3	2.0	0.2	37.0	3.1	35.2	3.0	3.0	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.5	2.5	0.2	7.2	24.2	2.7	5.6	5.7	16.9	4.5	4.8	6.5
LnGrp Delay(d),s/veh	61.2	10.0	0.6	82.9	34.8	15.7	91.0	60.9	88.3	52.7	62.1	44.4
LnGrp LOS	Е	А	Α	F	С	В	F	Е	F	D	Е	D
Approach Vol, veh/h		3425			2533			890			575	
Approach Delay, s/veh		16.0			39.9			79.8			54.0	
Approach LOS		В			D			Е			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	20.0	79.0	19.0	22.0	26.6	72.4	16.7	24.3				
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0				
Max Green Setting (Gmax), s	14.0	73.0	13.0	16.0	22.0	65.0	11.0	18.0				
Max Q Clear Time (g_c+l1), s	15.2	2.0	15.0	16.6	20.2	53.4	10.7	20.3				
Green Ext Time (p_c), s	0.0	69.1	0.0	0.0	0.3	11.6	0.0	0.0				
Intersection Summary												
HCM 2010 Ctrl Delay			34.7									
HCM 2010 LOS			С									

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	ሻ	<b>^</b>	7	ሻ	<b>^</b>	7	7		7	77		7
Volume (veh/h)	237	1750	169	193	2233	261	120	190	175	181	212	188
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1845	1845	1845	1845	1863	1863	1863
Adj Flow Rate, veh/h	263	1944	188	214	2481	290	133	211	194	201	236	209
Adj No. of Lanes	1	3	1	1	3	1	1	1	1	2	1	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	2	2	2
Cap, veh/h	264	2857	1019	237	2636	930	145	262	348	239	241	400
Arrive On Green	0.12	0.57	0.57	0.05	0.35	0.35	0.08	0.14	0.14	0.07	0.13	0.13
Sat Flow, veh/h	1757	5036	1568	1757	5036	1568	1757	1845	1568	3442	1863	1583
Grp Volume(v), veh/h	263	1944	188	214	2481	290	133	211	194	201	236	209
Grp Sat Flow(s),veh/h/ln	1757	1679	1568	1757	1679	1568	1757	1845	1568	1721	1863	1583
Q Serve(g_s), s	20.9	46.2	8.1	11.1	81.2	19.9	12.8	18.8	18.7	9.8	21.5	19.3
Cycle Q Clear(g_c), s	20.9	46.2	8.1	11.1	81.2	19.9	12.8	18.8	18.7	9.8	21.5	19.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	264	2857	1019	237	2636	930	145	262	348	239	241	400
V/C Ratio(X)	1.00	0.68	0.18	0.90	0.94	0.31	0.92	0.80	0.56	0.84	0.98	0.52
Avail Cap(c_a), veh/h	264	2857	1019	376	2636	930	145	262	348	243	241	400
HCM Platoon Ratio	1.00	1.00	1.00	0.67	0.67	0.67	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.58	0.58	0.58	0.67	0.67	0.67	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	62.2	25.9	11.8	39.6	52.6	24.7	77.4	70.6	58.7	78.2	73.8	54.7
Incr Delay (d2), s/veh	41.4	8.0	0.2	11.8	6.0	0.6	51.3	16.5	2.0	22.0	51.9	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	15.4	21.6	3.5	10.8	39.1	8.8	8.3	10.8	8.3	5.4	14.6	8.6
LnGrp Delay(d),s/veh	103.6	26.7	12.1	51.4	58.6	25.3	128.7	87.1	60.7	100.2	125.6	55.9
LnGrp LOS	F	С	В	D	Е	С	F	F	Е	F	F	Е
Approach Vol, veh/h		2395			2985			538			646	
Approach Delay, s/veh		34.0			54.8			87.9			95.1	
Approach LOS		С			D			F			F	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	19.5	102.5	20.0	28.0	27.0	95.0	17.8	30.2				
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0				
Max Green Setting (Gmax), s	27.0	83.0	14.0	22.0	21.0	89.0	12.0	24.0				
Max Q Clear Time (g_c+l1), s	13.1	48.2	14.8	23.5	22.9	83.2	11.8	20.8				
Green Ext Time (p_c), s	0.5	34.0	0.0	0.0	0.0	5.8	0.0	1.4				
Intersection Summary												
HCM 2010 Ctrl Delay			53.9									
HCM 2010 LOS			D									

	۶	<b>→</b>	•	•	<b>←</b>	•	1	†	~	<b>\</b>	<b>↓</b>	<b>√</b>
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	7	ተተተ	7	7	ተተተ	7	7	<b>^</b>	7	1,1	<b>†</b>	7
Volume (veh/h)	293	2370	116	203	1954	159	101	173	247	199	203	225
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1845	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	326	2633	129	226	2171	177	112	192	274	221	226	250
Adj No. of Lanes	1	3	1	1	3	1	1	1	1	2	1	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	3	3	3	3	3	3	2	2	2	2	2	2
Cap, veh/h	327	2734	952	219	2446	874	114	226	339	246	239	441
Arrive On Green	0.15	0.54	0.54	0.06	0.33	0.33	0.06	0.12	0.12	0.07	0.13	0.13
Sat Flow, veh/h	1757	5036	1568	1757	5036	1568	1774	1863	1583	3442	1863	1583
Grp Volume(v), veh/h	326	2633	129	226	2171	177	112	192	274	221	226	250
Grp Sat Flow(s),veh/h/ln	1757	1679	1568	1757	1679	1568	1774	1863	1583	1721	1863	1583
Q Serve(g_s), s	20.9	70.1	4.9	13.0	57.2	9.9	8.8	14.1	17.0	8.9	16.8	18.0
Cycle Q Clear(g_c), s	20.9	70.1	4.9	13.0	57.2	9.9	8.8	14.1	17.0	8.9	16.8	18.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	327	2734	952	219	2446	874	114	226	339	246	239	441
V/C Ratio(X)	1.00	0.96	0.14	1.03	0.89	0.20	0.98	0.85	0.81	0.90	0.94	0.57
Avail Cap(c_a), veh/h	327	2734	952	219	2446	874	114	226	339	246	239	441
HCM Platoon Ratio	1.00	1.00	1.00	0.67	0.67	0.67	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.25	0.25	0.25	0.78	0.78	0.78	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	47.8	30.7	11.8	48.9	43.6	20.9	65.4	60.2	52.3	64.5	60.5	43.3
Incr Delay (d2), s/veh	24.3	3.5	0.1	62.6	4.2	0.4	78.4	24.9	13.5	32.1	42.7	1.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	14.8	33.3	2.1	12.3	27.5	4.4	6.8	8.9	11.3	5.3	11.5	8.5
LnGrp Delay(d),s/veh	72.1	34.2	11.8	111.6	47.8	21.3	143.8	85.2	65.7	96.6	103.2	45.0
LnGrp LOS	Е	С	В	F	D	С	F	F	Е	F	F	D
Approach Vol, veh/h		3088			2574			578			697	
Approach Delay, s/veh		37.2			51.6			87.3			80.2	
Approach LOS		D			D			F			F	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	19.0	82.0	15.0	24.0	27.0	74.0	16.0	23.0				
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0				
Max Green Setting (Gmax), s	13.0	76.0	9.0	18.0	21.0	68.0	10.0	17.0				
Max Q Clear Time (g_c+l1), s	15.0	72.1	10.8	20.0	22.9	59.2	10.9	19.0				
Green Ext Time (p_c), s	0.0	3.9	0.0	0.0	0.0	8.7	0.0	0.0				
Intersection Summary												
HCM 2010 Ctrl Delay			51.0									
HCM 2010 LOS			D									

	<b>→</b>	*	<b>1</b>	<b>←</b>	1	_	
Movement	EBT	EBR	WBL	WBT	NBL	NBR	
Lane Configurations	ተተተ	7	ሻ	ተተተ	ሻ	7	
Volume (veh/h)	1999	107	111	2609	78	102	
Number	2	12	1	6	3	18	
nitial Q (Qb), veh	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	
Adj Sat Flow, veh/h/ln	1845	1845	1827	1827	1863	1863	
Adj Flow Rate, veh/h	2221	119	123	2899	87	113	
Adj No. of Lanes	3	1	1	3	1	1	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	
Percent Heavy Veh, %	3	3	4	4	2	2	
Cap, veh/h	3904	1341	253	4313	142	212	
Arrive On Green	1.00	1.00	0.11	1.00	0.08	0.08	
Sat Flow, veh/h	5202	1568	1740	5152	1774	1583	
Grp Volume(v), veh/h	2221	119	123	2899	87	113	
Grp Sat Flow(s), veh/h/ln	1679	1568	1740	1663	1774	1583	
Q Serve(g_s), s	0.0	0.0	2.1	0.0	7.9	11.1	
Cycle Q Clear(g_c), s	0.0	0.0	2.1	0.0	7.9	11.1	
Prop In Lane	0.0	1.00	1.00	0.0	1.00	1.00	
Lane Grp Cap(c), veh/h	3904	1341	253	4313	142	212	
V/C Ratio(X)	0.57	0.09	0.49	0.67	0.61	0.53	
Avail Cap(c_a), veh/h	3904	1341	368	4313	202	265	
HCM Platoon Ratio	2.00	2.00	2.00	2.00	1.00	1.00	
Upstream Filter(I)	0.63	0.63	0.26	0.26	1.00	1.00	
Uniform Delay (d), s/veh	0.0	0.0	2.2	0.0	74.4	67.5	
Incr Delay (d2), s/veh	0.4	0.1	0.4	0.2	4.2	2.1	
nitial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),veh/ln	0.1	0.0	1.0	0.1	4.1	5.0	
LnGrp Delay(d),s/veh	0.4	0.1	2.6	0.1	78.6	69.6	
LnGrp LOS	A	A	Α	A	7 G.G	E	
Approach Vol, veh/h	2340	- / \	, ,	3022	200		
Approach Delay, s/veh	0.4			0.3	73.5		
Approach LOS	0.4 A			0.5 A	73.5 E		
··	^						
Timer	1	2	3	4	5	6	7 8
Assigned Phs	1	2				6	8
Phs Duration (G+Y+Rc), s	15.0	135.6				150.6	19.4
Change Period (Y+Rc), s	6.0	6.0				6.0	6.0
Max Green Setting (Gmax), s	20.0	113.0				139.0	19.0
Max Q Clear Time (g_c+l1), s	4.1	2.0				2.0	13.1
Green Ext Time (p_c), s	0.2	108.2				132.7	0.3
Intersection Summary							
HCM 2010 Ctrl Delay			3.0				
HCM 2010 LOS			Α				

	<b>→</b>	*	•	<b>←</b>	1	<b>/</b>	
Movement	EBT	EBR	WBL	WBT	NBL	NBR	
Lane Configurations	ተተተ	7	*	ተተተ	*	7	
Volume (veh/h)	2716	100	128	2245	71	147	
Number	2	12	1	6	3	18	
Initial Q (Qb), veh	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1863	1863	
Adj Flow Rate, veh/h	3018	111	142	2494	79	163	
Adj No. of Lanes	3	1	1	3	1	1	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	
Percent Heavy Veh, %	3	3	3	3	2	2	
Cap, veh/h	3706	1266	214	4245	127	214	
Arrive On Green	1.00	1.00	0.13	1.00	0.07	0.07	
Sat Flow, veh/h	5202	1568	1757	5202	1774	1583	
Grp Volume(v), veh/h	3018	111	142	2494	79	163	
Grp Sat Flow(s),veh/h/ln	1679	1568	1757	1679	1774	1583	
Q Serve(g_s), s	0.0	0.0	2.3	0.0	6.1	10.0	
Cycle Q Clear(g_c), s	0.0	0.0	2.3	0.0	6.1	10.0	
Prop In Lane		1.00	1.00		1.00	1.00	
_ane Grp Cap(c), veh/h	3706	1266	214	4245	127	214	
V/C Ratio(X)	0.81	0.09	0.66	0.59	0.62	0.76	
Avail Cap(c_a), veh/h	3706	1266	278	4245	127	214	
HCM Platoon Ratio	2.00	2.00	2.00	2.00	1.00	1.00	
Jpstream Filter(I)	0.27	0.27	0.37	0.37	1.00	1.00	
Uniform Delay (d), s/veh	0.0	0.0	20.8	0.0	63.2	58.3	
Incr Delay (d2), s/veh	0.6	0.0	1.4	0.2	9.1	14.6	
nitial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),veh/ln	0.2	0.0	3.9	0.1	3.3	6.9	
LnGrp Delay(d),s/veh	0.6	0.0	22.2	0.2	72.3	72.9	
_nGrp LOS	А	А	С	Α	E	Е	
Approach Vol, veh/h	3129			2636	242		
Approach Delay, s/veh	0.5			1.4	72.7		
Approach LOS	A			Α	E		
Timer	1	2	3	4	5	6	7 8
Assigned Phs	1	2		•		6	8
Phs Duration (G+Y+Rc), s	15.0	109.0				124.0	16.0
Change Period (Y+Rc), s	6.0	6.0				6.0	6.0
Max Green Setting (Gmax), s	14.0	98.0				118.0	10.0
Max Q Clear Time (g_c+l1), s	4.3	2.0				2.0	12.0
Green Ext Time (p_c), s	0.2	94.9				114.4	0.0
Intersection Summary							
HCM 2010 Ctrl Delay			3.8				
HCM 2010 CM Delay			3.0 A				

	۶	-	7	•	+	4	1	†	~	-	<b>+</b>	4
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	ħ	ተተተ	7	ሻ	ተተተ	7	7	4₽	7	ሻ	4₽	7
Volume (veh/h)	222	1767	112	189	2428	353	146	79	177	212	90	146
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1827	1827	1827	1827	1827	1827	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	247	1963	124	210	2698	392	162	88	197	236	100	162
Adj No. of Lanes	1	3	1	1	3	1	2	1	1	2	1	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	4	4	4	4	4	4	2	2	2	2	2	2
Cap, veh/h	240	3015	1085	265	2787	1014	334	175	254	334	175	326
Arrive On Green	0.22	1.00	1.00	0.07	0.56	0.56	0.09	0.09	0.09	0.09	0.09	0.09
Sat Flow, veh/h	1740	4988	1553	1740	4988	1553	3548	1863	1583	3548	1863	1583
Grp Volume(v), veh/h	247	1963	124	210	2698	392	162	88	197	236	100	162
Grp Sat Flow(s),veh/h/ln	1740	1663	1553	1740	1663	1553	1774	1863	1583	1774	1863	1583
Q Serve(g_s), s	19.0	0.0	0.0	8.8	88.4	19.9	7.4	7.6	16.0	11.0	8.7	15.4
Cycle Q Clear(g_c), s	19.0	0.0	0.0	8.8	88.4	19.9	7.4	7.6	16.0	11.0	8.7	15.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	240	3015	1085	265	2787	1014	334	175	254	334	175	326
V/C Ratio(X)	1.03	0.65	0.11	0.79	0.97	0.39	0.49	0.50	0.78	0.71	0.57	0.50
Avail Cap(c_a), veh/h	240	3015	1085	427	2787	1014	334	175	254	334	175	326
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.78	0.78	0.78	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	54.0	0.0	0.0	15.7	36.0	13.7	73.1	73.2	68.5	74.7	73.7	59.7
Incr Delay (d2), s/veh	59.6	0.9	0.2	5.3	11.1	1.1	1.1	2.2	14.1	6.7	4.4	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	15.1	0.2	0.1	5.2	43.3	11.1	3.7	4.0	9.9	5.7	4.7	6.9
LnGrp Delay(d),s/veh	113.7	0.9	0.2	21.0	47.1	14.8	74.2	75.5	82.5	81.4	78.1	60.9
LnGrp LOS	F	А	A	С	D	В	E	E	F	F	E	E
Approach Vol, veh/h		2334	, ,		3300			447			498	
Approach Delay, s/veh		12.8			41.6			78.1			74.1	
Approach LOS		12.0 B			D			7 O. 1			F	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	17.2	108.8		22.0	25.0	101.0		22.0				
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s	27.0	87.0		16.0	19.0	95.0		16.0				
Max Q Clear Time (g_c+l1), s	10.8	2.0		17.4	21.0	90.4		18.0				
Green Ext Time (p_c), s	0.5	82.4		0.0	0.0	4.6		0.0				
Intersection Summary	0.0	UL.T		0.0	0.0	1.0		0.0				
HCM 2010 Ctrl Delay			36.3									
,												
HCM 2010 LOS			D									
Notes												

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User approved volume balancing among the lanes for turning movement.

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		ተተተ	7	ሻ	ተተተ	7	7	4₽	7	7	-4↑ <del>↑</del>	7
Volume (veh/h)	217	2528	118	193	2084	269	110	95	188	320	170	179
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1845	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	241	2809	131	214	2316	299	127	99	209	356	189	199
Adj No. of Lanes	1	3	1	1	3	1	2	1	1	2	1	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	3	3	3	3	3	3	2	2	2	2	2	2
Cap, veh/h	236	2662	1008	218	2518	963	405	213	294	405	213	339
Arrive On Green	0.20	1.00	1.00	0.07	0.50	0.50	0.11	0.11	0.11	0.11	0.11	0.11
Sat Flow, veh/h	1757	5036	1568	1757	5036	1568	3548	1863	1583	3548	1863	1583
Grp Volume(v), veh/h	241	2809	131	214	2316	299	127	99	209	356	189	199
Grp Sat Flow(s),veh/h/ln	1757	1679	1568	1757	1679	1568	1774	1863	1583	1774	1863	1583
Q Serve(g_s), s	14.0	0.0	0.0	9.6	59.6	12.7	4.6	7.0	16.0	13.8	14.0	15.8
Cycle Q Clear(g_c), s	14.0	0.0	0.0	9.6	59.6	12.7	4.6	7.0	16.0	13.8	14.0	15.8
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	236	2662	1008	218	2518	963	405	213	294	405	213	339
V/C Ratio(X)	1.02	1.06	0.13	0.98	0.92	0.31	0.31	0.47	0.71	0.88	0.89	0.59
Avail Cap(c_a), veh/h	236	2662	1008	218	2518	963	405	213	294	405	213	339
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.46	0.46	0.46	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	39.8	0.0	0.0	29.9	32.4	12.9	57.0	58.0	53.5	61.0	61.1	49.4
Incr Delay (d2), s/veh	45.8	29.9	0.1	54.8	6.9	0.8	0.4	1.6	7.8	19.1	33.2	2.6
Initial Q Delay(d3),s/veh	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	12.0	7.4	0.0	11.5	29.1	7.4	2.3	3.7	8.2	7.9	9.2	7.2
LnGrp Delay(d),s/veh	85.7	29.9	0.1	84.7	39.3	13.7	57.4	59.6	61.2	80.2	94.4	52.0
LnGrp LOS	F	F	Α	F	D	В	Е	Е	Е	F	F	D
Approach Vol, veh/h		3181			2829			435			744	
Approach Delay, s/veh		32.9			40.0			59.7			76.3	
Approach LOS		С			D			Е			E	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	16.0	80.0		22.0	20.0	76.0		22.0				
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s	10.0	74.0		16.0	14.0	70.0		16.0				
Max Q Clear Time (g_c+l1), s	11.6	2.0		17.8	16.0	61.6		18.0				
Green Ext Time (p_c), s	0.0	71.0		0.0	0.0	8.4		0.0				
Intersection Summary												
HCM 2010 Ctrl Delay			41.8									
HCM 2010 LOS			D									
Notes												

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User approved volume balancing among the lanes for turning movement.

# Appendix E Traffic Analysis Worksheets

2018 Opening Year

Build River Center Site Alternatives 5-7

North Charleston Intersections

	۶	<b>→</b>	•	<b>*</b>	-	•	1	<b>†</b>	<i>&gt;</i>	-	<b>↓</b>	4
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					<b>^</b>						ተተተ	7
Volume (veh/h)	0	0	0	0	147	0	0	0	0	0	1543	390
Number				7	4	14				5	2	12
Initial Q (Qb), veh				0	0	0				0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00				1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln				0	1827	0				0	1827	1827
Adj Flow Rate, veh/h				0	163	0				0	1714	433
Adj No. of Lanes				0	2	0				0	3	1
Peak Hour Factor				0.90	0.90	0.90				0.90	0.90	0.90
Percent Heavy Veh, %				0	4	0				0	4	4
Cap, veh/h				0	520	0				0	3153	982
Arrive On Green				0.00	0.15	0.00				0.00	0.63	0.63
Sat Flow, veh/h				0	3654	0				0	5152	1553
Grp Volume(v), veh/h				0	163	0				0	1714	433
Grp Sat Flow(s), veh/h/ln				0	1736	0				0	1663	1553
Q Serve(g_s), s				0.0	2.3	0.0				0.0	10.6	7.8
Cycle Q Clear(g_c), s				0.0	2.3	0.0				0.0	10.6	7.8
Prop In Lane				0.00	2.0	0.00				0.00	10.0	1.00
Lane Grp Cap(c), veh/h				0	520	0				0	3153	982
V/C Ratio(X)				0.00	0.31	0.00				0.00	0.54	0.44
Avail Cap(c_a), veh/h				0	945	0				0	5705	1776
HCM Platoon Ratio				1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)				0.00	1.00	0.00				0.00	1.00	1.00
Uniform Delay (d), s/veh				0.0	20.9	0.0				0.0	5.7	5.2
Incr Delay (d2), s/veh				0.0	0.3	0.0				0.0	0.1	0.3
Initial Q Delay(d3),s/veh				0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				0.0	1.1	0.0				0.0	4.8	3.3
LnGrp Delay(d),s/veh				0.0	21.2	0.0				0.0	5.8	5.5
LnGrp LOS				0.0	C	0.0				0.0	A	A
Approach Vol, veh/h					163						2147	
Approach Delay, s/veh					21.2						5.8	
Approach LOS					C C						3.0 A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	- '	2	<u> </u>	4	<u> </u>		- 1					
Phs Duration (G+Y+Rc), s		40.8		14.3								
Change Period (Y+Rc), s		6.0		6.0								
Max Green Setting (Gmax), s		63.0		15.0								
Max Q Clear Time (g_c+l1), s		12.6		4.3								
Green Ext Time (p_c), s		22.2		0.6								
(i = ).		22.2		0.0								
Intersection Summary			0.0									
HCM 2010 Ctrl Delay			6.8									
HCM 2010 LOS			Α									

	۶	-	•	<b>√</b>	<b>←</b>	•	•	†	<i>&gt;</i>	<b>\</b>	<b>↓</b>	4
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					<b>^</b>						ተተተ	7
Volume (veh/h)	0	0	0	0	223	0	0	0	0	0	941	283
Number				7	4	14				5	2	12
Initial Q (Qb), veh				0	0	0				0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00				1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln				0	1845	0				0	1827	1827
Adj Flow Rate, veh/h				0	248	0				0	1046	314
Adj No. of Lanes				0	2	0				0	3	1
Peak Hour Factor				0.90	0.90	0.90				0.90	0.90	0.90
Percent Heavy Veh, %				0	3	0				0	4	4
Cap, veh/h				0	772	0				0	2306	718
Arrive On Green				0.00	0.22	0.00				0.00	0.46	0.46
Sat Flow, veh/h				0	3689	0				0	5152	1553
Grp Volume(v), veh/h				0	248	0				0	1046	314
Grp Sat Flow(s), veh/h/ln				0	1752	0				0	1663	1553
Q Serve(g_s), s				0.0	2.2	0.0				0.0	5.4	5.2
Cycle Q Clear(g_c), s				0.0	2.2	0.0				0.0	5.4	5.2
Prop In Lane				0.00	2.2	0.00				0.00	0.1	1.00
Lane Grp Cap(c), veh/h				0.00	772	0.00				0.00	2306	718
V/C Ratio(X)				0.00	0.32	0.00				0.00	0.45	0.44
Avail Cap(c_a), veh/h				0.00	2317	0.00				0.00	6989	2176
HCM Platoon Ratio				1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)				0.00	1.00	0.00				0.00	1.00	1.00
Uniform Delay (d), s/veh				0.0	12.4	0.0				0.0	6.9	6.9
Incr Delay (d2), s/veh				0.0	0.2	0.0				0.0	0.1	0.4
Initial Q Delay(d3),s/veh				0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				0.0	1.1	0.0				0.0	2.5	2.3
LnGrp Delay(d),s/veh				0.0	12.6	0.0				0.0	7.1	7.3
LnGrp LOS				0.0	12.0 B	0.0				0.0	Α	7.5 A
Approach Vol, veh/h					248						1360	
Approach Delay, s/veh					12.6						7.1	
Approach LOS					12.0 B						Α	
Approach LOS					Ь							
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4								
Phs Duration (G+Y+Rc), s		23.5		14.3								
Change Period (Y+Rc), s		6.0		6.0								
Max Green Setting (Gmax), s		53.0		25.0								
Max Q Clear Time (g_c+I1), s		7.4		4.2								
Green Ext Time (p_c), s		10.1		1.4								
Intersection Summary												
HCM 2010 Ctrl Delay			8.0									
HCM 2010 LOS			Α									

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		<b>^</b>						ተተተ	7			
Volume (veh/h)	0	380	0	0	0	0	0	783	96	0	0	0
Number	3	8	18				1	6	16			
Initial Q (Qb), veh	0	0	0				0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	0	1827	0				0	1810	1810			
Adj Flow Rate, veh/h	0	422	0				0	870	107			
Adj No. of Lanes	0	2	0				0	3	1			
Peak Hour Factor	0.90	0.90	0.90				0.90	0.90	0.90			
Percent Heavy Veh, %	0	4	0				0	5	5			
Cap, veh/h	0	836	0				0	2143	667			
Arrive On Green	0.00	0.24	0.00				0.00	0.43	0.43			
Sat Flow, veh/h	0	3654	0				0	5103	1538			
Grp Volume(v), veh/h	0	422	0				0	870	107			
Grp Sat Flow(s),veh/h/ln	0	1736	0				0	1647	1538			
Q Serve(g_s), s	0.0	3.9	0.0				0.0	4.5	1.6			
Cycle Q Clear(g_c), s	0.0	3.9	0.0				0.0	4.5	1.6			
Prop In Lane	0.00		0.00				0.00		1.00			
Lane Grp Cap(c), veh/h	0	836	0				0	2143	667			
V/C Ratio(X)	0.00	0.50	0.00				0.00	0.41	0.16			
Avail Cap(c_a), veh/h	0	3200	0				0	5894	1835			
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00			
Upstream Filter(I)	0.00	1.00	0.00				0.00	1.00	1.00			
Uniform Delay (d), s/veh	0.0	12.1	0.0				0.0	7.2	6.4			
Incr Delay (d2), s/veh	0.0	0.5	0.0				0.0	0.1	0.1			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.0	1.9	0.0				0.0	2.0	0.7			
LnGrp Delay(d),s/veh	0.0	12.6	0.0				0.0	7.3	6.5			
LnGrp LOS		В						А	А			
Approach Vol, veh/h		422						977				
Approach Delay, s/veh		12.6						7.2				
Approach LOS		В						A				
Timer	1	2	3	4	5	6	7	8				
Assigned Phs						6		8				
Phs Duration (G+Y+Rc), s						22.0		14.9				
Change Period (Y+Rc), s						6.0		6.0				
Max Green Setting (Gmax), s						44.0		34.0				
Max Q Clear Time (g_c+l1), s						6.5		5.9				
Green Ext Time (p_c), s						6.9		2.8				
Intersection Summary												
HCM 2010 Ctrl Delay			8.8									
HCM 2010 LOS			Α									

	۶	<b>→</b>	•	<b>*</b>	<b>←</b>	4	1	<b>†</b>	<i>&gt;</i>	-	ļ	4
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		<b>^</b>						<b>^</b>	7			
Volume (veh/h)	0	283	0	0	0	0	0	1419	177	0	0	0
Number	3	8	18				1	6	16			
Initial Q (Qb), veh	0	0	0				0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	0	1845	0				0	1827	1827			
Adj Flow Rate, veh/h	0	314	0				0	1577	197			
Adj No. of Lanes	0	2	0				0	3	1			
Peak Hour Factor	0.90	0.90	0.90				0.90	0.90	0.90			
Percent Heavy Veh, %	0	3	0				0	4	4			
Cap, veh/h	0	630	0				0	2879	896			
Arrive On Green	0.00	0.18	0.00				0.00	0.58	0.58			
Sat Flow, veh/h	0	3689	0				0	5152	1553			
Grp Volume(v), veh/h	0	314	0				0	1577	197			
Grp Sat Flow(s),veh/h/ln	0	1752	0				0	1663	1553			
Q Serve(g_s), s	0.0	4.0	0.0				0.0	9.7	3.0			
Cycle Q Clear(g_c), s	0.0	4.0	0.0				0.0	9.7	3.0			
Prop In Lane	0.00		0.00				0.00		1.00			
Lane Grp Cap(c), veh/h	0	630	0				0	2879	896			
V/C Ratio(X)	0.00	0.50	0.00				0.00	0.55	0.22			
Avail Cap(c_a), veh/h	0	1490	0				0	5756	1792			
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00			
Upstream Filter(I)	0.00	1.00	0.00				0.00	1.00	1.00			
Uniform Delay (d), s/veh	0.0	18.2	0.0				0.0	6.5	5.1			
Incr Delay (d2), s/veh	0.0	0.6	0.0				0.0	0.2	0.1			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.0	2.0	0.0				0.0	4.4	1.3			
LnGrp Delay(d),s/veh	0.0	18.9	0.0				0.0	6.6	5.2			
LnGrp LOS		В						Α	Α			
Approach Vol, veh/h		314						1774				
Approach Delay, s/veh		18.9						6.5				
Approach LOS		В						A				
Timer	1	2	3	4	5	6	7	8				
Assigned Phs						6		8				
Phs Duration (G+Y+Rc), s						34.5		14.9				
Change Period (Y+Rc), s						6.0		6.0				
Max Green Setting (Gmax), s						57.0		21.0				
Max Q Clear Time (g_c+l1), s						11.7		6.0				
Green Ext Time (p_c), s						16.9		1.6				
Intersection Summary												
HCM 2010 Ctrl Delay			8.3									
HCM 2010 LOS			Α									

Lane Configurations		۶	<b>→</b>	•	✓	<b>←</b>	•	1	†	~	<b>/</b>	<b>↓</b>	4
Volume (veh/h)	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Volume (veh/h)	Lane Configurations			7		<b>↑</b>		7				<b>^</b>	7
Initial Q (Qb), veh	Volume (veh/h)	0	143	45	0		0	46	0	0	0		420
Ped-Bike Adj(A_pbT)         1.00 </td <td>Number</td> <td>7</td> <td>4</td> <td>14</td> <td>3</td> <td>8</td> <td>18</td> <td>1</td> <td>6</td> <td>16</td> <td>5</td> <td>2</td> <td>12</td>	Number	7	4	14	3	8	18	1	6	16	5	2	12
Parking Bus, Adj	Initial Q (Qb), veh	0	0	0	0	0	0		0	0	0	0	
Adj Sat Flow, veh/h/ln	Ped-Bike Adj(A_pbT)												
Adj Flow Rate, veh/h Adj No. of Lanes O 1 1 1 0 1 0 1 0 1 0 0 0 1 1419 467 Adj No. of Lanes O 0 1 1 1 0 0 1 0 1 0 0 0 0 0 3 1 Peak Hour Factor O.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90	Parking Bus, Adj	1.00			1.00		1.00		1.00	1.00	1.00		
Adj No. of Lanes 0 1 1 1 0 1 0 1 0 0 0 0 3 1 1 Peak Hour Factor 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.9	Adj Sat Flow, veh/h/ln				0	1863	0		0	0	0		
Peak Hour Factor         0.90         0.00	Adj Flow Rate, veh/h		159	50		0	0	51					467
Percent Heavy Veh, % 0 2 2 2 0 2 0 6 0 0 0 0 5 5 5 Cap, veh/h 0 217 184 0 217 0 110 0 0 0 3667 1142 Arrive On Green 0.00 0.12 0.12 0.00 0.00 0.00 0.00 0.00	Adj No. of Lanes												1
Cap, veh/h         0         217         184         0         217         0         110         0         0         3667         1142           Arrive On Green         0.00         0.12         0.12         0.00         1419         467           Gry Volume(v), veh/h         0         1583         1583         0         1863         0         1707         D         0         1647         1538           Q Serve(g. s), s         0.0         9.1         3.2         0.0         0.0         0.0         3.2         0.0         11.5         12.4           Cycle Q Clear(g. s), s         0.0         9.1         3.2         0.0         0.0         0.0         3.2         0.0         11.5         12.4           Prop In Lane         0.00         9.1         3.2         0.0         0.0 <t< td=""><td>Peak Hour Factor</td><td>0.90</td><td></td><td></td><td>0.90</td><td></td><td>0.90</td><td>0.90</td><td>0.90</td><td>0.90</td><td>0.90</td><td></td><td>0.90</td></t<>	Peak Hour Factor	0.90			0.90		0.90	0.90	0.90	0.90	0.90		0.90
Arrive On Green         0.00         0.12         0.12         0.01         0.00         0.00         0.00         0.00         0.00         0.00         0.74         0.74           Sat Flow, veh/h         0         1863         1583         0         1863         0         1707         51         0         5103         1538           Grp Volume(v), veh/h         0         159         50         0         0         0         51         52.9         0         1419         467           Grp Sat Flow(s), veh/h/In         0         1863         1583         0         1863         1707         D         0         1647         1538           Q Serve(g_s), s         0.0         9.1         3.2         0.0         0.0         0.0         3.2         0.0         11.5         12.4           Cycle Q Clear(g_c), s         0.0         9.1         3.2         0.0         0.0         3.2         0.0         11.5         12.4           Prop In Lane         0.00         1.00         0.00         0.00         1.00         1.00         1.00         1.00         1.00         1.00         1.00         1.00         1.00         1.00         1.00         1.00 </td <td>Percent Heavy Veh, %</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>0</td> <td></td> <td></td>	Percent Heavy Veh, %										0		
Sat Flow, veh/h         0         1863         1583         0         1863         0         1707         51         0         5103         1538           Grp Volume(v), veh/h         0         159         50         0         0         0         51         52.9         0         1419         467           Grp Sat Flow(s), veh/h/In         0         1863         1583         0         1863         0         1707         D         0         1647         1538           Q Serve(g_s), s         0.0         9.1         3.2         0.0         0.0         0.0         3.2         0.0         11.5         12.4           Cycle Q Clear(g_c), s         0.0         9.1         3.2         0.0         0.0         0.0         3.2         0.0         11.5         12.4           Prop In Lane         0.00         1.00         0.00         0.0         0.0         1.00 <t< td=""><td>Cap, veh/h</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>	Cap, veh/h												
Gry Volume(v), veh/h         0         159         50         0         0         0         51         52.9         0         1419         467           Grp Sat Flow(s),veh/h/ln         0         1863         1583         0         1863         0         1707         D         0         1647         1538           Q Serve(g_s), s         0.0         9.1         3.2         0.0         0.0         0.0         3.2         0.0         11.5         12.4           Cycle Q Clear(g_c), s         0.0         9.1         3.2         0.0         0.0         0.0         3.2         0.0         11.5         12.4           Prop In Lane         0.00         1.00         0.00         0.00         0.00         0.00         1.00         0.00         1.00         12.4           Prop In Lane         0.00         1.00         0.00         0.00         0.00         0.00         0.00         1.00         1.00         1.00         1.00         1.00         1.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         1.00         1.00         1.00         1.00         1.00         1.00 <td>Arrive On Green</td> <td>0.00</td> <td></td> <td></td> <td>0.00</td> <td></td> <td>0.00</td> <td></td> <td></td> <td>0.00</td> <td>0.00</td> <td></td> <td></td>	Arrive On Green	0.00			0.00		0.00			0.00	0.00		
Grp Sat Flow(s),veh/h/ln         0         1863         1583         0         1863         0         1707         D         0         1647         1538           Q Serve(g_s), s         0.0         9.1         3.2         0.0         0.0         0.0         3.2         0.0         11.5         12.4           Cycle Q Clear(g_c), s         0.0         9.1         3.2         0.0         0.0         0.0         3.2         0.0         11.5         12.4           Prop In Lane         0.00         1.00         0.00         0.00         1.00         0.00         0.00         1.00           Lane Grp Cap(c), veh/h         0         217         184         0         217         0         110         0         3667         1142           V/C Ratio(X)         0.00         0.73         0.27         0.00         0.00         0.46         0.00         0.39         0.41           Avail Cap(c_a), veh/h         0         438         373         0         438         0         201         0         3667         1142           HCM Platoon Ratio         1.00         1.00         1.00         1.00         1.00         1.00         1.00         1.00	Sat Flow, veh/h	0	1863	1583	0	1863	0	1707	51		0	5103	1538
Q Serve(g_s), s       0.0       9.1       3.2       0.0       0.0       0.0       3.2       0.0       11.5       12.4         Cycle Q Clear(g_c), s       0.0       9.1       3.2       0.0       0.0       0.0       3.2       0.0       11.5       12.4         Prop In Lane       0.00       1.00       0.00       0.00       1.00       0.00       1.00         Lane Grp Cap(c), veh/h       0       217       184       0       217       0       110       0       3667       1142         V/C Ratio(X)       0.00       0.73       0.27       0.00       0.00       0.00       0.46       0.00       0.39       0.41         Avail Cap(c_a), veh/h       0       438       373       0       438       0       201       0       3667       1142         HCM Platoon Ratio       1.00       <	Grp Volume(v), veh/h	0	159	50	0	0	0	51	52.9		0	1419	467
Cycle Q Clear(g_c), s         0.0         9.1         3.2         0.0         0.0         0.0         3.2         0.0         11.5         12.4           Prop In Lane         0.00         1.00         0.00         0.00         1.00         0.00         1.00           Lane Grp Cap(c), veh/h         0         217         184         0         217         0         110         0         3667         1142           V/C Ratio(X)         0.00         0.73         0.27         0.00         0.00         0.046         0.00         0.39         0.41           Avail Cap(c_a), veh/h         0         438         373         0         438         0         201         0         3667         1142           HCM Platoon Ratio         1.00	Grp Sat Flow(s),veh/h/ln	0	1863	1583	0	1863	0	1707	D		0	1647	1538
Prop In Lane         0.00         1.00         0.00         1.00         0.00         1.00           Lane Grp Cap(c), veh/h         0         217         184         0         217         0         110         0         3667         1142           V/C Ratio(X)         0.00         0.73         0.27         0.00         0.00         0.46         0.00         0.39         0.41           Avail Cap(c_a), veh/h         0         438         373         0         438         0         201         0         3667         1142           HCM Platoon Ratio         1.00         1	Q Serve(g_s), s	0.0	9.1	3.2	0.0	0.0	0.0	3.2			0.0	11.5	12.4
Lane Grp Cap(c), veh/h         0         217         184         0         217         0         110         0         3667         1142           V/C Ratio(X)         0.00         0.73         0.27         0.00         0.00         0.04         0.00         0.39         0.41           Avail Cap(c_a), veh/h         0         438         373         0         438         0         201         0         3667         1142           HCM Platoon Ratio         1.00 </td <td>Cycle Q Clear(g_c), s</td> <td>0.0</td> <td>9.1</td> <td>3.2</td> <td>0.0</td> <td>0.0</td> <td>0.0</td> <td>3.2</td> <td></td> <td></td> <td>0.0</td> <td>11.5</td> <td>12.4</td>	Cycle Q Clear(g_c), s	0.0	9.1	3.2	0.0	0.0	0.0	3.2			0.0	11.5	12.4
V/C Ratio(X)       0.00       0.73       0.27       0.00       0.00       0.00       0.46       0.00       0.39       0.41         Avail Cap(c_a), veh/h       0       438       373       0       438       0       201       0       3667       1142         HCM Platoon Ratio       1.00	Prop In Lane	0.00		1.00	0.00		0.00	1.00			0.00		1.00
Avail Cap(c_a), veh/h         0         438         373         0         438         0         201         0         3667         1142           HCM Platoon Ratio         1.00	Lane Grp Cap(c), veh/h	0	217	184	0	217	0	110			0	3667	1142
HCM Platoon Ratio       1.00       1.	V/C Ratio(X)	0.00	0.73	0.27	0.00	0.00	0.00	0.46			0.00	0.39	0.41
Upstream Filter(I)       0.00       1.00       1.00       0.00       0.00       1.53       1.53       1.53       1.53       1.10       1.00       1.00       1.53       1.53       1.10       1.00       1.00       1.53       1.53       1.53       1.53       1.00       1.00       1.00       1.53       1.53       1.53       1.10       1.00       1	Avail Cap(c_a), veh/h	0	438		0	438					0	3667	1142
Uniform Delay (d), s/veh         0.0         47.2         44.5         0.0         0.0         0.0         49.8         0.0         5.1         5.3           Incr Delay (d2), s/veh         0.0         4.7         0.8         0.0         5.5         5.5         6.4         0.0         0.0         52.9         0.0         5.5         6.4         0.0         A	HCM Platoon Ratio		1.00		1.00	1.00	1.00	1.00				1.00	1.00
Incr Delay (d2), s/veh         0.0         4.7         0.8         0.0         0.0         0.0         3.0         0.0         0.3         1.1           Initial Q Delay(d3),s/veh         0.0         5.2         5.5         5.5         6.4         0.0         5.1         9         45.3         0.0         0.0         0.0         52.9         0.0         5.5         6.4         6.4         A	Upstream Filter(I)												
Initial Q Delay(d3),s/veh       0.0       5.2       5.5       5.5       5.5       5.5       5.5       5.5       5.5       5.5       6.4 <t< td=""><td>Uniform Delay (d), s/veh</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>	Uniform Delay (d), s/veh												
%ile BackOfQ(50%),veh/ln       0.0       5.0       1.4       0.0       0.0       0.0       1.6       0.0       5.2       5.5         LnGrp Delay(d),s/veh       0.0       51.9       45.3       0.0       0.0       0.0       52.9       0.0       5.5       6.4         LnGrp LOS       D       D       D       D       A       A         Approach Vol, veh/h       209       0       1886         Approach Delay, s/veh       50.3       0.0       5.7         Approach LOS       D       A         Timer       1       2       3       4       5       6       7       8         Assigned Phs       1       2       4       8         Phs Duration (G+Y+Rc), s       13.1       88.0       18.9       18.9	Incr Delay (d2), s/veh												
LnGrp Delay(d),s/veh         0.0         51.9         45.3         0.0         0.0         52.9         0.0         5.5         6.4           LnGrp LOS         D         D         D         D         A <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>													
LnGrp LOS         D         D         D         A         A           Approach Vol, veh/h         209         0         1886           Approach Delay, s/veh         50.3         0.0         5.7           Approach LOS         D         A         A           Timer         1         2         3         4         5         6         7         8           Assigned Phs         1         2         4         8           Phs Duration (G+Y+Rc), s         13.1         88.0         18.9         18.9													
Approach Vol, veh/h       209       0       1886         Approach Delay, s/veh       50.3       0.0       5.7         Approach LOS       D       A         Timer       1       2       3       4       5       6       7       8         Assigned Phs       1       2       4       8         Phs Duration (G+Y+Rc), s       13.1       88.0       18.9       18.9		0.0			0.0	0.0	0.0				0.0		
Approach Delay, s/veh 50.3 0.0 5.7 Approach LOS D A  Timer 1 2 3 4 5 6 7 8 Assigned Phs 1 2 4 8 Phs Duration (G+Y+Rc), s 13.1 88.0 18.9 18.9	-			D				D					<u>A</u>
Approach LOS D A  Timer 1 2 3 4 5 6 7 8  Assigned Phs 1 2 4 8  Phs Duration (G+Y+Rc), s 13.1 88.0 18.9 18.9	• • • • • • • • • • • • • • • • • • • •												
Timer     1     2     3     4     5     6     7     8       Assigned Phs     1     2     4     8       Phs Duration (G+Y+Rc), s     13.1     88.0     18.9     18.9						0.0							
Assigned Phs 1 2 4 8 Phs Duration (G+Y+Rc), s 13.1 88.0 18.9 18.9	Approach LOS		D									Α	
Phs Duration (G+Y+Rc), s 13.1 88.0 18.9 18.9	Timer	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s 13.1 88.0 18.9 18.9	Assigned Phs	1	2		4				8				
Change Period (Y+Rc), s 6.0 6.0 6.0 6.0	Phs Duration (G+Y+Rc), s	13.1	88.0		18.9				18.9				
	Change Period (Y+Rc), s	6.0	6.0		6.0				6.0				
Max Green Setting (Gmax), s 13.0 63.0 26.0 26.0	Max Green Setting (Gmax), s	13.0	63.0		26.0				26.0				
Max Q Clear Time (g_c+l1), s 5.2 14.4 12.1 0.0	Max Q Clear Time (g_c+l1), s	5.2	14.4		12.1				0.0				
Green Ext Time (p_c), s 0.0 17.0 0.8 0.0	Green Ext Time (p_c), s	0.0	17.0		8.0				0.0				
Intersection Summary	Intersection Summary												
	HCM 2010 Ctrl Delay			11.1									
,	HCM 2010 LOS												

	۶	-	•	•	<b>←</b>	•	•	†	<i>&gt;</i>	<b>\</b>	<b></b>	<b>√</b>
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		<b>1</b>	7		<b>†</b>		7				ተተተ	7
Volume (veh/h)	0	322	67	0	0	0	60	0	0	0	777	208
Number	7	4	14	3	8	18	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1863	1863	0	1863	0	1810	0	0	0	1827	1827
Adj Flow Rate, veh/h	0	358	74	0	0	0	67	0	0	0	863	231
Adj No. of Lanes	0	1	1	0	1	0	1	0	0	0	3	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	0	2	2	0	2	0	5	0	0	0	4	4
Cap, veh/h	0	434	369	0	434	0	126	0	0	0	3285	1023
Arrive On Green	0.00	0.23	0.23	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.66	0.66
Sat Flow, veh/h	0	1863	1583	0	1863	0	1723	67		0	5152	1553
Grp Volume(v), veh/h	0	358	74	0	0	0	67	50.7		0	863	231
Grp Sat Flow(s), veh/h/ln	0	1863	1583	0	1863	0	1723	D		0	1663	1553
Q Serve(g_s), s	0.0	19.3	4.0	0.0	0.0	0.0	4.0	_		0.0	7.5	6.3
Cycle Q Clear(g_c), s	0.0	19.3	4.0	0.0	0.0	0.0	4.0			0.0	7.5	6.3
Prop In Lane	0.00		1.00	0.00	0.0	0.00	1.00			0.00		1.00
Lane Grp Cap(c), veh/h	0	434	369	0	434	0	126			0	3285	1023
V/C Ratio(X)	0.00	0.82	0.20	0.00	0.00	0.00	0.53			0.00	0.26	0.23
Avail Cap(c_a), veh/h	0	828	704	0	828	0	228			0	3285	1023
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	0.00	0.00	0.00	1.00			0.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	38.5	32.6	0.0	0.0	0.0	47.2			0.0	7.4	7.2
Incr Delay (d2), s/veh	0.0	4.0	0.3	0.0	0.0	0.0	3.4			0.0	0.2	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	10.4	1.8	0.0	0.0	0.0	2.0			0.0	3.5	2.8
LnGrp Delay(d),s/veh	0.0	42.5	32.9	0.0	0.0	0.0	50.7			0.0	7.6	7.7
LnGrp LOS	0.0	D	C	0.0	0.0	0.0	D			0.0	A	Α
Approach Vol, veh/h		432			0						1094	
Approach Delay, s/veh		40.8			0.0						7.7	
Approach LOS		¬о.о			0.0						Α	
	1		2	4	_	0	7	0				
Timer	1	2	3	4	5	6	1	8				
Assigned Phs	1	2		4				8				
Phs Duration (G+Y+Rc), s	13.7	75.6		30.6				30.6				
Change Period (Y+Rc), s	6.0	6.0		6.0				6.0				
Max Green Setting (Gmax), s	14.0	41.0		47.0				47.0				
Max Q Clear Time (g_c+l1), s	6.0	9.5		22.3				0.0				
Green Ext Time (p_c), s	0.1	7.2		2.4				0.0				
Intersection Summary												
HCM 2010 Ctrl Delay			18.5									
HCM 2010 LOS			В									

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		<b>†</b>			<b>1</b>	7		ተተኈ		ሻ		
Volume (veh/h)	0	0	0	0	14	196	0	516	75	73	0	0
Number	7	4	14	3	8	18	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1863	0	0	1863	1863	0	1759	1900	1792	0	0
Adj Flow Rate, veh/h	0	0	0	0	16	218	0	573	83	81	0	0
Adj No. of Lanes	0	1	0	0	1	1	0	3	0	1	0	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	0	2	0	0	2	2	0	8	8	6	0	0
Cap, veh/h	0	206	0	0	206	1087	0	2447	350	158	0	0
Arrive On Green	0.00	0.00	0.00	0.00	0.11	0.11	0.00	0.58	0.58	0.09	0.00	0.00
Sat Flow, veh/h	0	1863	0	0	1863	1583	0	4406	607	1707	81	
Grp Volume(v), veh/h	0	0	0	0	16	218	0	430	226	81	37.8	
Grp Sat Flow(s), veh/h/ln	0	1863	0	0	1863	1583	0	1601	1652	1707	D	
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.6	4.1	0.0	5.4	5.5	3.7		
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	0.6	4.1	0.0	5.4	5.5	3.7		
Prop In Lane	0.00		0.00	0.00		1.00	0.00		0.37	1.00		
Lane Grp Cap(c), veh/h	0	206	0	0	206	1087	0	1845	952	158		
V/C Ratio(X)	0.00	0.00	0.00	0.00	0.08	0.20	0.00	0.23	0.24	0.51		
Avail Cap(c_a), veh/h	0	457	0	0	457	1301	0	1845	952	733		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	0.00	0.00	0.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	32.6	4.6	0.0	8.5	8.5	35.2		
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.3	0.6	2.5		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.0	0.0	0.3	4.9	0.0	2.4	2.6	1.8		
LnGrp Delay(d),s/veh	0.0	0.0	0.0	0.0	32.7	4.7	0.0	8.8	9.1	37.8		
LnGrp LOS					С	Α		Α	Α	D		
Approach Vol, veh/h		0			234			656				
Approach Delay, s/veh		0.0			6.6			8.9				
Approach LOS		0.0			А			A				
Timer	1	2	3	4	5	6	7	8				
Assigned Phs				4	5	6		8				
Phs Duration (G+Y+Rc), s				15.0	13.6	53.0		15.0				
Change Period (Y+Rc), s				6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s				20.0	35.0	47.0		20.0				
Max Q Clear Time (g_c+l1), s				0.0	5.7	7.5		6.1				
Green Ext Time (p_c), s				0.0	0.2	4.3		0.7				
Intersection Summary												
HCM 2010 Ctrl Delay			10.7									
HCM 2010 LOS			В									

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		<b>†</b>			<b>†</b>	7		ተተ <sub>ጉ</sub>		ሻ		
Volume (veh/h)	0	0	0	0	4	237	0	1083	96	33	0	0
Number	7	4	14	3	8	18	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1863	0	0	1863	1863	0	1792	1900	1810	0	0
Adj Flow Rate, veh/h	0	0	0	0	4	263	0	1203	107	37	0	0
Adj No. of Lanes	0	1	0	0	1	1	0	3	0	1	0	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	0	2	0	0	2	2	0	6	6	5	0	0
Cap, veh/h	0	183	0	0	183	1177	0	2951	262	103	0	0
Arrive On Green	0.00	0.00	0.00	0.00	0.10	0.10	0.00	0.64	0.64	0.06	0.00	0.00
Sat Flow, veh/h	0	1863	0	0	1863	1583	0	4737	407	1723	37	
Grp Volume(v), veh/h	0	0	0	0	4	263	0	858	452	37	43.4	
Grp Sat Flow(s),veh/h/ln	0	1863	0	0	1863	1583	0	1631	1721	1723	D	
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.2	4.7	0.0	11.6	11.6	1.9		
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	0.2	4.7	0.0	11.6	11.6	1.9		
Prop In Lane	0.00		0.00	0.00		1.00	0.00		0.24	1.00		
Lane Grp Cap(c), veh/h	0	183	0	0	183	1177	0	2104	1110	103		
V/C Ratio(X)	0.00	0.00	0.00	0.00	0.02	0.22	0.00	0.41	0.41	0.36		
Avail Cap(c_a), veh/h	0	224	0	0	224	1211	0	2104	1110	603		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	0.00	0.00	0.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	37.3	3.6	0.0	7.8	7.8	41.3		
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.6	1.1	2.1		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.0	0.0	0.1	6.6	0.0	5.3	5.7	1.0		
LnGrp Delay(d),s/veh	0.0	0.0	0.0	0.0	37.3	3.7	0.0	8.4	8.9	43.4		
LnGrp LOS					D	Α		Α	Α	D		
Approach Vol, veh/h		0			267			1310				
Approach Delay, s/veh		0.0			4.2			8.6				
Approach LOS					Α			Α				
Timer	1	2	3	4	5	6	7	8				
Assigned Phs				4	5	6		8				
Phs Duration (G+Y+Rc), s				15.0	11.5	65.0		15.0				
Change Period (Y+Rc), s				6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s				11.0	32.0	59.0		11.0				
Max Q Clear Time (g_c+l1), s				0.0	3.9	13.6		6.7				
Green Ext Time (p_c), s				0.0	0.1	10.7		0.4				
Intersection Summary												
HCM 2010 Ctrl Delay			8.7									
HCM 2010 LOS			Α									

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		<b>†</b>			<b>1</b>	7		ተተተ	7	ሻ		
Volume (veh/h)	0	0	0	0	161	67	0	559	44	125	0	0
Number	7	4	14	3	8	18	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1863	0	0	1776	1776	0	1759	1759	1759	0	0
Adj Flow Rate, veh/h	0	0	0	0	179	74	0	621	49	139	0	0
Adj No. of Lanes	0	1	0	0	1	1	0	3	1	1	0	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	0	2	0	0	7	7	0	8	8	8	0	0
Cap, veh/h	0	260	0	0	248	976	0	2434	758	190	0	0
Arrive On Green	0.00	0.00	0.00	0.00	0.14	0.14	0.00	0.51	0.51	0.11	0.00	0.00
Sat Flow, veh/h	0	1863	0	0	1776	1509	0	4961	1495	1675	139	
Grp Volume(v), veh/h	0	0	0	0	179	74	0	621	49	139	37.5	
Grp Sat Flow(s),veh/h/ln	0	1863	0	0	1776	1509	0	1601	1495	1675	D	
Q Serve(g_s), s	0.0	0.0	0.0	0.0	7.2	1.4	0.0	5.5	1.3	6.0		
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	7.2	1.4	0.0	5.5	1.3	6.0		
Prop In Lane	0.00		0.00	0.00		1.00	0.00		1.00	1.00		
Lane Grp Cap(c), veh/h	0	260	0	0	248	976	0	2434	758	190		
V/C Ratio(X)	0.00	0.00	0.00	0.00	0.72	0.08	0.00	0.26	0.06	0.73		
Avail Cap(c_a), veh/h	0	845	0	0	805	1449	0	2434	758	670		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	0.00	0.00	0.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	30.9	4.9	0.0	10.5	9.4	32.1		
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.0	3.9	0.0	0.0	0.3	0.2	5.3		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.0	0.0	3.8	1.4	0.0	2.5	0.6	3.1		
LnGrp Delay(d),s/veh	0.0	0.0	0.0	0.0	34.8	5.0	0.0	10.7	9.6	37.5		
LnGrp LOS					С	Α		В	Α	D		
Approach Vol, veh/h		0			253			670				
Approach Delay, s/veh		0.0			26.1			10.6				
Approach LOS		0.0			C			В				
Timer	1	2	3	4	5	6	7	8				
Assigned Phs				4	5	6		8				
Phs Duration (G+Y+Rc), s				16.5	14.5	44.0		16.5				
Change Period (Y+Rc), s				6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s				34.0	30.0	38.0		34.0				
Max Q Clear Time (g_c+l1), s				0.0	8.0	7.5		9.2				
Green Ext Time (p_c), s				0.0	0.3	4.4		1.3				
Intersection Summary												
HCM 2010 Ctrl Delay			17.8									
HCM 2010 LOS			В									

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		<b>†</b>			<b>1</b>	7		ተተተ	7	ሻ		
Volume (veh/h)	0	0	0	0	105	108	0	1057	84	94	0	0
Number	7	4	14	3	8	18	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1863	0	0	1827	1827	0	1776	1776	1792	0	0
Adj Flow Rate, veh/h	0	0	0	0	117	120	0	1174	93	104	0	0
Adj No. of Lanes	0	1	0	0	1	1	0	3	1	1	0	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	0	2	0	0	4	4	0	7	7	6	0	0
Cap, veh/h	0	181	0	0	178	1109	0	2992	932	155	0	0
Arrive On Green	0.00	0.00	0.00	0.00	0.10	0.10	0.00	0.62	0.62	0.09	0.00	0.00
Sat Flow, veh/h	0	1863	0	0	1827	1553	0	5007	1509	1707	104	
Grp Volume(v), veh/h	0	0	0	0	117	120	0	1174	93	104	45.6	
Grp Sat Flow(s),veh/h/ln	0	1863	0	0	1827	1553	0	1616	1509	1707	D	
Q Serve(g_s), s	0.0	0.0	0.0	0.0	5.7	2.2	0.0	11.3	2.3	5.4		
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	5.7	2.2	0.0	11.3	2.3	5.4		
Prop In Lane	0.00		0.00	0.00		1.00	0.00		1.00	1.00		
Lane Grp Cap(c), veh/h	0	181	0	0	178	1109	0	2992	932	155		
V/C Ratio(X)	0.00	0.00	0.00	0.00	0.66	0.11	0.00	0.39	0.10	0.67		
Avail Cap(c_a), veh/h	0	464	0	0	455	1345	0	2992	932	407		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	0.00	0.00	0.00	0.00	0.98	0.98	0.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	40.2	4.1	0.0	8.9	7.2	40.7		
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.0	4.1	0.0	0.0	0.4	0.2	5.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.0	0.0	3.1	3.0	0.0	5.1	1.0	2.8		
LnGrp Delay(d),s/veh	0.0	0.0	0.0	0.0	44.3	4.1	0.0	9.3	7.4	45.6		
LnGrp LOS					D	Α		Α	А	D		
Approach Vol, veh/h		0			237			1267				
Approach Delay, s/veh		0.0			23.9			9.2				
Approach LOS		0.0			С			A				
Timer	1	2	3	4	5	6	7	8				
Assigned Phs				4	5	6		8				
Phs Duration (G+Y+Rc), s				15.0	14.4	63.0		15.0				
Change Period (Y+Rc), s				6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s				23.0	22.0	57.0		23.0				
Max Q Clear Time (g_c+l1), s				0.0	7.4	13.3		7.7				
Green Ext Time (p_c), s				0.0	0.2	10.3		0.9				
Intersection Summary												
HCM 2010 Ctrl Delay			13.7									
HCM 2010 LOS			В									

	۶	7	1	†	<b>+</b>	4	
Movement	EBL	EBR	NBL	NBT	SBT	SBR	
Lane Configurations	1,4	7	ሻ	ተተተ	ተተተ	7	
Volume (veh/h)	67	15	37	560	930	137	
Number	3	18	1	6	2	12	
Initial Q (Qb), veh	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	
Adj Sat Flow, veh/h/ln	1545	1545	1792	1792	1759	1759	
Adj Flow Rate, veh/h	74	17	41	622	1033	152	
Adj No. of Lanes	2	1	1	3	3	1	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	
Percent Heavy Veh, %	23	23	6	6	8	8	
Cap, veh/h	344	158	419	3535	3470	1080	
Arrive On Green	0.12	0.12	1.00	1.00	0.72	0.72	
Sat Flow, veh/h	2854	1313	453	5055	4961	1495	
Grp Volume(v), veh/h	74	17	41	622	1033	152	
Grp Sat Flow(s),veh/h/ln	1427	1313	453	1631	1601	1495	
Q Serve(g_s), s	1.3	0.7	0.6	0.0	4.3	1.8	
Cycle Q Clear(g_c), s	1.3	0.7	4.9	0.0	4.3	1.8	
Prop In Lane	1.00	1.00	1.00			1.00	
Lane Grp Cap(c), veh/h	344	158	419	3535	3470	1080	
V/C Ratio(X)	0.22	0.11	0.10	0.18	0.30	0.14	
Avail Cap(c_a), veh/h	652	300	419	3535	3470	1080	
HCM Platoon Ratio	1.00	1.00	2.00	2.00	1.00	1.00	
Upstream Filter(I)	1.00	1.00	0.95	0.95	1.00	1.00	
Uniform Delay (d), s/veh	22.6	22.3	0.3	0.0	2.8	2.4	
Incr Delay (d2), s/veh	0.3	0.3	0.4	0.1	0.2	0.3	
nitial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),veh/ln	0.5	0.2	0.1	0.0	1.9	0.8	
LnGrp Delay(d),s/veh	22.9	22.6	0.7	0.1	3.0	2.7	
LnGrp LOS	С	С	Α	Α	Α	Α	
Approach Vol, veh/h	91			663	1185		
Approach Delay, s/veh	22.9			0.1	3.0		
Approach LOS	С			А	А		
Timer	1	2	3	4	5	6	7 8
Assigned Phs		2				6	8
Phs Duration (G+Y+Rc), s		47.1				47.1	12.9
Change Period (Y+Rc), s		6.0				6.0	6.0
Max Green Setting (Gmax), s		35.0				35.0	13.0
Max Q Clear Time (g_c+l1), s		6.3				6.9	3.3
Green Ext Time (p_c), s		14.6				14.4	0.2
Intersection Summary							
HCM 2010 Ctrl Delay			2.9				
HCM 2010 LOS			Α				

	ၨ	<b>~</b>	1	1	Ţ	4		
Movement	EBL	EBR	NBL	NBT	SBT	SBR		
Lane Configurations	1,4	7	7	<b>^</b> ^	ተተተ	7		
Volume (veh/h)	129	43	37	945	697	84		
Number	3	18	1	6	2	12		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1624	1624	1827	1827	1776	1776		
Adj Flow Rate, veh/h	143	48	41	1050	774	93		
Adj No. of Lanes	2	1	1	3	3	1		
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90		
Percent Heavy Veh, %	17	17	4	4	7	7		
Cap, veh/h	449	206	518	3433	3337	1039		
Arrive On Green	0.15	0.15	0.46	0.46	0.69	0.69		
Sat Flow, veh/h	3000	1380	624	5152	5007	1509		
Grp Volume(v), veh/h	143	48	41	1050	774	93		
Grp Sat Flow(s),veh/h/ln	1500	1380	624	1663	1616	1509		
Q Serve(g_s), s	2.4	1.8	2.3	7.6	3.4	1.2		
Cycle Q Clear(g_c), s	2.4	1.8	5.7	7.6	3.4	1.2		
Prop In Lane	1.00	1.00	1.00			1.00		
Lane Grp Cap(c), veh/h	449	206	518	3433	3337	1039		
V/C Ratio(X)	0.32	0.23	0.08	0.31	0.23	0.09		
Avail Cap(c_a), veh/h	733	337	518	3433	3337	1039		
HCM Platoon Ratio	1.00	1.00	0.67	0.67	1.00	1.00		
Upstream Filter(I)	1.00	1.00	0.88	0.88	1.00	1.00		
Uniform Delay (d), s/veh	21.8	21.5	7.4	6.8	3.3	3.0		
Incr Delay (d2), s/veh	0.4	0.6	0.3	0.2	0.2	0.2		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	1.0	0.7	0.4	3.5	1.6	0.5		
LnGrp Delay(d),s/veh	22.2	22.0	7.6	7.1	3.5	3.1		
LnGrp LOS	С	С	Α	Α	Α	Α		
Approach Vol, veh/h	191			1091	867			
Approach Delay, s/veh	22.1			7.1	3.4			
Approach LOS	С			Α	Α			
Timer	1	2	3	4	5	6	7 8	
Assigned Phs		2				6	8	
Phs Duration (G+Y+Rc), s		45.4				45.4	14.6	
Change Period (Y+Rc), s		6.0				6.0	6.0	
Max Green Setting (Gmax), s		34.0				34.0	14.0	
Max Q Clear Time (g_c+l1), s		5.4				9.6	4.4	
Green Ext Time (p_c), s		15.6				14.2	0.4	
Intersection Summary								
HCM 2010 Ctrl Delay			6.9					
HCM 2010 LOS			Α					

	۶	<b>→</b>	•	<b>*</b>	<b>←</b>	•	1	†	<i>*</i>	<b>/</b>	<b>+</b>	<b>√</b>
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	7	f)		7	<b>↑</b>	7		ፈተኩ		ሻ	<b>^</b>	7
Volume (veh/h)	68	68	5	126	87	130	18	432	185	163	636	152
Number	3	8	18	7	4	14	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1743	1743	1900	1845	1845	1845	1900	1845	1900	1792	1792	1792
Adj Flow Rate, veh/h	76	76	6	140	97	144	20	480	206	181	707	169
Adj No. of Lanes	1	1	0	1	1	1	0	3	0	1	2	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	9	9	9	3	3	3	3	3	3	6	6	6
Cap, veh/h	288	431	34	251	265	225	81	1825	752	553	2376	1174
Arrive On Green	0.07	0.27	0.27	0.14	0.14	0.14	0.56	0.56	0.56	0.16	1.00	1.00
Sat Flow, veh/h	1660	1595	126	1298	1845	1568	81	3239	1336	1707	3406	1524
Grp Volume(v), veh/h	76	0	82	140	97	144	257	227	223	181	707	169
Grp Sat Flow(s),veh/h/ln	1660	0	1721	1298	1845	1568	1685	1528	1443	1707	1703	1524
Q Serve(g_s), s	4.1	0.0	4.1	11.6	5.3	9.7	0.0	8.5	8.9	4.6	0.0	0.0
Cycle Q Clear(g_c), s	4.1	0.0	4.1	11.6	5.3	9.7	7.9	8.5	8.9	4.6	0.0	0.0
Prop In Lane	1.00		0.07	1.00		1.00	80.0		0.93	1.00		1.00
Lane Grp Cap(c), veh/h	288	0	465	251	265	225	984	861	813	553	2376	1174
V/C Ratio(X)	0.26	0.00	0.18	0.56	0.37	0.64	0.26	0.26	0.27	0.33	0.30	0.14
Avail Cap(c_a), veh/h	330	0	725	414	496	422	984	861	813	644	2376	1174
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.97	0.97
Uniform Delay (d), s/veh	34.5	0.0	31.2	45.9	43.2	45.1	12.4	12.5	12.6	7.2	0.0	0.0
Incr Delay (d2), s/veh	0.5	0.0	0.2	1.9	0.8	3.0	0.6	0.7	0.8	0.3	0.3	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	0.0	2.0	4.3	2.8	4.4	4.2	3.8	3.7	2.1	0.1	0.1
LnGrp Delay(d),s/veh	35.0	0.0	31.4	47.8	44.1	48.1	13.0	13.2	13.4	7.5	0.3	0.3
LnGrp LOS	D		С	D	D	D	В	В	В	А	Α	Α
Approach Vol, veh/h		158			381			706			1057	
Approach Delay, s/veh		33.1			47.0			13.2			1.5	
Approach LOS		С			D			В			Α	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2	3	4	5	6		8				
Phs Duration (G+Y+Rc), s		83.9	14.1	22.0	15.0	68.9		36.1				
Change Period (Y+Rc), s		6.0	6.0	6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s		61.0	11.0	30.0	15.0	40.0		47.0				
Max Q Clear Time (g_c+l1), s		2.0	6.1	13.6	6.6	10.9		6.1				
Green Ext Time (p_c), s		14.3	0.1	1.7	0.3	11.9		2.0				
Intersection Summary												
HCM 2010 Ctrl Delay			14.8									
HCM 2010 LOS			В									

	۶	<b>→</b>	•	•	<b>←</b>	4	1	†	<u> </u>	<b>&gt;</b>	ļ	4
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	7	ĵ.		7	<b>^</b>	7		4 <b>†</b> †		7	<b>^</b>	7
Volume (veh/h)	108	120	5	118	57	150	5	757	205	128	464	116
Number	3	8	18	7	4	14	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1776	1776	1900	1863	1863	1863	1900	1863	1900	1827	1827	1827
Adj Flow Rate, veh/h	120	133	6	131	63	167	6	841	228	142	516	129
Adj No. of Lanes	1	1	0	1	1	1	0	3	0	1	2	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	7	7	7	2	2	2	2	2	2	4	4	4
Cap, veh/h	314	456	21	238	262	222	36	2111	566	416	2353	1173
Arrive On Green	0.08	0.27	0.27	0.14	0.14	0.14	0.55	0.55	0.55	0.16	1.00	1.00
Sat Flow, veh/h	1691	1686	76	1245	1863	1583	7	3865	1036	1740	3471	1553
Grp Volume(v), veh/h	120	0	139	131	63	167	405	337	333	142	516	129
Grp Sat Flow(s), veh/h/ln	1691	0	1762	1245	1863	1583	1853	1543	1512	1740	1736	1553
Q Serve(g_s), s	6.7	0.0	7.1	11.5	3.4	11.5	0.0	14.5	14.6	3.6	0.0	0.0
Cycle Q Clear(g_c), s	6.7	0.0	7.1	11.5	3.4	11.5	14.4	14.5	14.6	3.6	0.0	0.0
Prop In Lane	1.00	0.0	0.04	1.00	0.1	1.00	0.01	11.0	0.68	1.00	0.0	1.00
Lane Grp Cap(c), veh/h	314	0	477	238	262	222	1044	842	826	416	2353	1173
V/C Ratio(X)	0.38	0.00	0.29	0.55	0.24	0.75	0.39	0.40	0.40	0.34	0.22	0.11
Avail Cap(c_a), veh/h	347	0.00	665	347	425	361	1044	842	826	477	2353	1173
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	0.98	0.98
Uniform Delay (d), s/veh	36.0	0.0	32.9	47.0	43.5	47.0	15.0	15.0	15.0	8.7	0.0	0.0
Incr Delay (d2), s/veh	0.8	0.0	0.3	2.0	0.5	5.0	1.1	1.4	1.5	0.5	0.2	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.1	0.0	3.5	4.1	1.8	5.4	7.6	6.4	6.4	1.7	0.1	0.1
LnGrp Delay(d),s/veh	36.8	0.0	33.2	49.0	44.0	52.1	16.1	16.4	16.5	9.2	0.2	0.2
LnGrp LOS	D	0.0	C	D	D	D	В	В	В	Α.Δ	Α	A
Approach Vol, veh/h		259			361			1075		7.	787	
Approach Delay, s/veh		34.9			49.6			16.3			1.8	
Approach LOS		C			43.0 D			В			Α	
	1		2	4		0	7					
Timer	1	2	3	4	5	6		8				
Assigned Phs		2	3	4	5	6		8				
Phs Duration (G+Y+Rc), s		83.2	14.8	22.0	15.0	68.2		36.8				
Change Period (Y+Rc), s		6.0	6.0	6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s		65.0	11.0	26.0	13.0	46.0		43.0				
Max Q Clear Time (g_c+l1), s		2.0	8.7	13.5	5.6	16.6		9.1				
Green Ext Time (p_c), s		16.3	0.1	1.7	0.2	13.1		2.2				
Intersection Summary												
HCM 2010 Ctrl Delay			18.5									
HCM 2010 LOS			В									

	۶	<b>→</b>	•	✓	<b>←</b>	•	1	†	~	<b>/</b>	<b></b>	4
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4			4		7	ተኈ		ሻ	<b>∱</b> ∱	
Volume (veh/h)	5	11	20	69	13	17	14	617	27	19	773	9
Number	3	8	18	7	4	14	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1900	1845	1900	1845	1845	1900	1845	1845	1900
Adj Flow Rate, veh/h	6	12	22	77	14	19	16	686	30	21	859	10
Adj No. of Lanes	0	1	0	0	1	0	1	2	0	1	2	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	3	3	3	3	3	3	3	3	3
Cap, veh/h	111	176	252	380	72	69	346	1678	73	403	1740	20
Arrive On Green	0.28	0.28	0.28	0.28	0.28	0.28	0.49	0.49	0.49	0.49	0.49	0.49
Sat Flow, veh/h	110	638	914	946	262	252	628	3421	150	725	3548	41
Grp Volume(v), veh/h	40	0	0	110	0	0	16	351	365	21	424	445
Grp Sat Flow(s),veh/h/ln	1662	0	0	1460	0	0	628	1752	1818	725	1752	1837
Q Serve(g_s), s	0.0	0.0	0.0	1.9	0.0	0.0	0.9	6.5	6.6	1.0	8.3	8.3
Cycle Q Clear(g_c), s	0.9	0.0	0.0	2.8	0.0	0.0	9.2	6.5	6.6	7.5	8.3	8.3
Prop In Lane	0.15		0.55	0.70		0.17	1.00		0.08	1.00		0.02
Lane Grp Cap(c), veh/h	538	0	0	522	0	0	346	859	892	403	859	901
V/C Ratio(X)	0.07	0.00	0.00	0.21	0.00	0.00	0.05	0.41	0.41	0.05	0.49	0.49
Avail Cap(c_a), veh/h	914	0	0	855	0	0	676	1779	1845	784	1779	1865
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	13.8	0.0	0.0	14.4	0.0	0.0	11.9	8.3	8.3	10.7	8.8	8.8
Incr Delay (d2), s/veh	0.1	0.0	0.0	0.2	0.0	0.0	0.1	0.3	0.3	0.1	0.4	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	0.0	1.2	0.0	0.0	0.2	3.2	3.3	0.2	4.1	4.3
LnGrp Delay(d),s/veh	13.8	0.0	0.0	14.6	0.0	0.0	11.9	8.6	8.6	10.8	9.2	9.2
LnGrp LOS	В			В			В	Α	А	В	А	Α
Approach Vol, veh/h		40			110			732			890	
Approach Delay, s/veh		13.8			14.6			8.7			9.2	
Approach LOS		В			В			Α			Α	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		31.1		20.1		31.1		20.1				
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0				
Max Green Setting (Gmax), s		52.0		26.0		52.0		26.0				
Max Q Clear Time (g_c+l1), s		10.3		4.8		11.2		2.9				
Green Ext Time (p_c), s		14.0		0.8		13.9		0.8				
Intersection Summary												
HCM 2010 Ctrl Delay			9.5									
HCM 2010 LOS			Α									

	۶	<b>→</b>	•	<b>√</b>	<b>←</b>	•	1	†	<i>&gt;</i>	<b>/</b>	<b></b>	<b>√</b>
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4			4		7	<b>ተ</b> ኈ		ሻ	<b>∱</b> ∱	
Volume (veh/h)	6	7	13	42	19	29	20	933	53	18	572	8
Number	3	8	18	7	4	14	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1900	1863	1900	1845	1845	1900	1863	1863	1900
Adj Flow Rate, veh/h	7	8	14	47	21	32	22	1037	59	20	636	9
Adj No. of Lanes	0	1	0	0	1	0	1	2	0	1	2	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	3	3	3	2	2	2
Cap, veh/h	135	148	192	239	112	122	474	1848	105	303	1958	28
Arrive On Green	0.24	0.24	0.24	0.24	0.24	0.24	0.55	0.55	0.55	0.55	0.55	0.55
Sat Flow, veh/h	235	610	789	604	461	501	774	3371	192	512	3573	51
Grp Volume(v), veh/h	29	0	0	100	0	0	22	539	557	20	315	330
Grp Sat Flow(s),veh/h/ln	1633	0	0	1566	0	0	774	1752	1811	512	1770	1854
Q Serve(g_s), s	0.0	0.0	0.0	0.4	0.0	0.0	0.9	11.5	11.5	1.5	5.6	5.6
Cycle Q Clear(g_c), s	0.7	0.0	0.0	2.7	0.0	0.0	6.5	11.5	11.5	13.1	5.6	5.6
Prop In Lane	0.24		0.48	0.47		0.32	1.00		0.11	1.00		0.03
Lane Grp Cap(c), veh/h	475	0	0	473	0	0	474	961	993	303	970	1016
V/C Ratio(X)	0.06	0.00	0.00	0.21	0.00	0.00	0.05	0.56	0.56	0.07	0.32	0.32
Avail Cap(c_a), veh/h	696	0	0	686	0	0	805	1708	1765	522	1725	1807
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	16.7	0.0	0.0	17.5	0.0	0.0	8.9	8.5	8.5	12.7	7.1	7.1
Incr Delay (d2), s/veh	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.5	0.5	0.1	0.2	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	0.0	1.3	0.0	0.0	0.2	5.7	5.9	0.2	2.8	2.9
LnGrp Delay(d),s/veh	16.8	0.0	0.0	17.7	0.0	0.0	9.0	9.0	9.0	12.8	7.3	7.3
LnGrp LOS	В			В			Α	Α	А	В	А	Α
Approach Vol, veh/h		29			100			1118			665	
Approach Delay, s/veh		16.8			17.7			9.0			7.5	
Approach LOS		В			В			Α			Α	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		37.5		20.0		37.5		20.0				
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0				
Max Green Setting (Gmax), s		56.0		22.0		56.0		22.0				
Max Q Clear Time (g_c+I1), s		15.1		4.7		13.5		2.7				
Green Ext Time (p_c), s		16.4		0.6		16.6		0.6				
Intersection Summary												
HCM 2010 Ctrl Delay			9.0									
HCM 2010 LOS			Α									

	<u></u>	<b>→</b>	7	<b>√</b>	<b>—</b>	•	1	†	~	<b>\</b>	<b>↓</b>	1
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		<b>€</b> 1₽			4	7	*	<b>^</b>	7	7	十十	7
Volume (veh/h)	39	52	11	124	78	113	9	563	269	158	775	48
Number	3	8	18	7	4	14	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1759	1900	1900	1827	1827	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h	43	58	12	138	87	126	10	626	299	176	861	53
Adj No. of Lanes	0	2	0	0	1	1	1	2	1	1	2	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	8	8	8	4	4	4	3	3	3	3	3	3
Cap, veh/h	137	318	66	238	121	384	415	2078	929	540	2506	1121
Arrive On Green	0.25	0.25	0.25	0.25	0.25	0.25	1.00	1.00	1.00	0.07	0.71	0.71
Sat Flow, veh/h	318	1288	266	771	491	1553	602	3505	1568	1757	3505	1568
Grp Volume(v), veh/h	43	0	70	225	0	126	10	626	299	176	861	53
Grp Sat Flow(s),veh/h/ln	318	0	1554	1262	0	1553	602	1752	1568	1757	1752	1568
Q Serve(g_s), s	4.6	0.0	4.4	17.4	0.0	8.2	0.0	0.0	0.0	4.3	11.4	1.2
Cycle Q Clear(g_c), s	26.2	0.0	4.4	21.7	0.0	8.2	0.1	0.0	0.0	4.3	11.4	1.2
Prop In Lane	1.00		0.17	0.61		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	137	0	384	359	0	384	415	2078	929	540	2506	1121
V/C Ratio(X)	0.31	0.00	0.18	0.63	0.00	0.33	0.02	0.30	0.32	0.33	0.34	0.05
Avail Cap(c_a), veh/h	269	0	570	534	0	570	415	2078	929	713	2506	1121
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.97	0.00	0.97	0.94	0.94	0.94	0.88	0.88	0.88
Uniform Delay (d), s/veh	55.0	0.0	36.4	44.8	0.0	37.8	0.0	0.0	0.0	6.9	6.6	5.2
Incr Delay (d2), s/veh	1.3	0.0	0.2	1.7	0.0	0.5	0.1	0.4	0.9	0.3	0.3	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	0.0	1.9	7.2	0.0	3.6	0.0	0.1	0.2	2.1	5.6	0.6
LnGrp Delay(d),s/veh	56.3	0.0	36.6	46.6	0.0	38.3	0.1	0.4	0.9	7.2	6.9	5.2
LnGrp LOS	E	0.0	D	D	0.0	D	A	Α	A	A	А	A
Approach Vol, veh/h		113			351		,,	935	,,	,,	1090	7.
Approach Delay, s/veh		44.1			43.6			0.5			6.9	
Approach LOS		D			75.0 D			Α			Α	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		93.7		36.3	15.0	78.7		36.3				
Change Period (Y+Rc), s		6.0		6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s		73.0		45.0	21.0	46.0		45.0				
Max Q Clear Time (g_c+l1), s		13.4		23.7	6.3	2.1		28.2				
Green Ext Time (p_c), s		18.4		2.3	0.4	17.0		2.2				
Intersection Summary												
HCM 2010 Ctrl Delay			11.4									
HCM 2010 LOS			В									

	ၨ	<b>→</b>	7	<b>*</b>	<b>←</b>	*	1	†	_	<b>\</b>	<b>↓</b>	4
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		<b>€</b> 1₽			4	7	*	<b>^</b>	7	7	十十	7
Volume (veh/h)	30	45	28	184	91	257	29	752	175	98	503	47
Number	3	8	18	7	4	14	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1792	1900	1900	1845	1845	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h	33	50	31	204	101	286	32	836	194	109	559	52
Adj No. of Lanes	0	2	0	0	1	1	1	2	1	1	2	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	6	6	6	3	3	3	3	3	3	3	3	3
Cap, veh/h	121	289	189	309	129	478	483	1867	835	471	2287	1023
Arrive On Green	0.30	0.30	0.30	0.30	0.30	0.30	1.00	1.00	1.00	0.07	0.65	0.65
Sat Flow, veh/h	218	949	620	852	422	1568	799	3505	1568	1757	3505	1568
Grp Volume(v), veh/h	38	0	76	305	0	286	32	836	194	109	559	52
Grp Sat Flow(s),veh/h/ln	265	0	1522	1274	0	1568	799	1752	1568	1757	1752	1568
Q Serve(g_s), s	3.9	0.0	4.5	24.2	0.0	19.1	0.0	0.0	0.0	3.1	8.1	1.5
Cycle Q Clear(g_c), s	32.2	0.0	4.5	28.5	0.0	19.1	0.2	0.0	0.0	3.1	8.1	1.5
Prop In Lane	0.87		0.41	0.67		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	136	0	464	437	0	478	483	1867	835	471	2287	1023
V/C Ratio(X)	0.28	0.00	0.16	0.70	0.00	0.60	0.07	0.45	0.23	0.23	0.24	0.05
Avail Cap(c_a), veh/h	246	0	630	594	0	649	483	1867	835	502	2287	1023
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.91	0.00	0.91	0.90	0.90	0.90	0.96	0.96	0.96
Uniform Delay (d), s/veh	51.0	0.0	31.3	41.7	0.0	36.4	0.0	0.0	0.0	9.5	8.8	7.7
Incr Delay (d2), s/veh	1.1	0.0	0.2	2.0	0.0	1.1	0.2	0.7	0.6	0.2	0.2	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	0.0	1.9	9.8	0.0	8.4	0.0	0.2	0.1	1.5	4.0	0.7
LnGrp Delay(d),s/veh	52.1	0.0	31.5	43.7	0.0	37.5	0.2	0.7	0.6	9.7	9.1	7.8
LnGrp LOS	D		С	D		D	Α	Α	А	Α	Α	Α
Approach Vol, veh/h		114			591			1062			720	
Approach Delay, s/veh		38.3			40.7			0.7			9.1	
Approach LOS		D			D			A			A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		86.5		43.5	14.8	71.7		43.5				
Change Period (Y+Rc), s		6.0		6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s		67.0		51.0	11.0	50.0		51.0				
Max Q Clear Time (g_c+l1), s		10.1		30.5	5.1	2.2		34.2				
Green Ext Time (p_c), s		15.9		3.5	0.1	15.3		3.3				
Intersection Summary												
HCM 2010 Ctrl Delay			14.3									
HCM 2010 LOS			В									

	ၨ	7	1	†	<b>+</b>	4	
Movement	EBL	EBR	NBL	NBT	SBT	SBR	
Lane Configurations	ሻ	7	ሻ	<b>^</b>	<b>^</b>	7	
Volume (veh/h)	184	146	126	553	740	108	
Number	3	18	1	6	2	12	
Initial Q (Qb), veh	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	
Adj Sat Flow, veh/h/ln	1810	1810	1827	1827	1845	1845	
Adj Flow Rate, veh/h	204	162	140	614	822	120	
Adj No. of Lanes	1	1	1	2	2	1	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	
Percent Heavy Veh, %	5	5	4	4	3	3	
Cap, veh/h	269	240	470	2433	2456	1099	
Arrive On Green	0.16	0.16	0.93	0.93	0.70	0.70	
Sat Flow, veh/h	1723	1538	581	3563	3597	1568	
Grp Volume(v), veh/h	204	162	140	614	822	120	
Grp Sat Flow(s),veh/h/ln	1723	1538	581	1736	1752	1568	
Q Serve(g_s), s	7.0	6.1	4.2	1.0	5.7	1.5	
Cycle Q Clear(g_c), s	7.0	6.1	9.8	1.0	5.7	1.5	
Prop In Lane	1.00	1.00	1.00			1.00	
Lane Grp Cap(c), veh/h	269	240	470	2433	2456	1099	
V/C Ratio(X)	0.76	0.67	0.30	0.25	0.33	0.11	
Avail Cap(c_a), veh/h	446	398	470	2433	2456	1099	
HCM Platoon Ratio	1.00	1.00	1.33	1.33	1.00	1.00	
Upstream Filter(I)	0.91	0.91	0.80	0.80	0.94	0.94	
Uniform Delay (d), s/veh	25.0	24.6	1.8	0.7	3.6	3.0	
Incr Delay (d2), s/veh	3.9	3.0	1.3	0.2	0.3	0.2	
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),veh/ln	3.6	2.8	8.0	0.5	2.7	0.7	
LnGrp Delay(d),s/veh	28.9	27.6	3.0	0.9	4.0	3.2	
LnGrp LOS	С	С	Α	Α	Α	Α	
Approach Vol, veh/h	366			754	942		
Approach Delay, s/veh	28.3			1.3	3.9		
Approach LOS	С			Α	Α		
Timer	1	2	3	4	5	6	7 8
Assigned Phs		2				6	3
Phs Duration (G+Y+Rc), s		49.3				49.3	15.7
Change Period (Y+Rc), s		6.0				6.0	6.0
Max Green Setting (Gmax), s		37.0				37.0	16.0
Max Q Clear Time (g_c+l1), s		7.7				11.8	9.0
Green Ext Time (p_c), s		14.5				13.4	0.7
Intersection Summary							
HCM 2010 Ctrl Delay			7.3				
HCM 2010 LOS			Α				

	≯	7	1	†	<b></b>	4	
Movement	EBL	EBR	NBL	NBT	SBT	SBR	
Lane Configurations	7	7	7	<b>^</b>	<b>^</b>	7	
Volume (veh/h)	171	102	186	812	563	156	
Number	3	18	1	6	2	12	
Initial Q (Qb), veh	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	
Adj Sat Flow, veh/h/ln	1827	1827	1845	1845	1845	1845	
Adj Flow Rate, veh/h	190	113	207	902	626	173	
Adj No. of Lanes	1	1	1	2	2	1	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	
Percent Heavy Veh, %	4	4	3	3	3	3	
Cap, veh/h	250	223	588	2470	2470	1105	
Arrive On Green	0.14	0.14	0.94	0.94	1.00	1.00	
Sat Flow, veh/h	1740	1553	671	3597	3597	1568	
Grp Volume(v), veh/h	190	113	207	902	626	173	
Grp Sat Flow(s),veh/h/ln	1740	1553	671	1752	1752	1568	
Q Serve(g_s), s	6.6	4.2	2.0	1.5	0.0	0.0	
Cycle Q Clear(g_c), s	6.6	4.2	2.0	1.5	0.0	0.0	
Prop In Lane	1.00	1.00	1.00			1.00	
Lane Grp Cap(c), veh/h	250	223	588	2470	2470	1105	
V/C Ratio(X)	0.76	0.51	0.35	0.37	0.25	0.16	
Avail Cap(c_a), veh/h	390	348	588	2470	2470	1105	
HCM Platoon Ratio	1.00	1.00	1.33	1.33	2.00	2.00	
Upstream Filter(I)	0.96	0.96	0.70	0.70	0.98	0.98	
Uniform Delay (d), s/veh	25.7	24.7	0.6	0.6	0.0	0.0	
Incr Delay (d2), s/veh	4.6	1.7	1.2	0.3	0.2	0.3	
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),veh/ln	3.5	1.9	0.5	0.7	0.1	0.1	
LnGrp Delay(d),s/veh	30.3	26.4	1.8	0.9	0.2	0.3	
LnGrp LOS	С	С	Α	Α	Α	Α	
Approach Vol, veh/h	303			1109	799		
Approach Delay, s/veh	28.9			1.1	0.3		
Approach LOS	С			Α	Α		
Timer	1	2	3	4	5	6	7 8
Assigned Phs		2				6	8
Phs Duration (G+Y+Rc), s		50.0				50.0	15.0
Change Period (Y+Rc), s		6.0				6.0	6.0
Max Green Setting (Gmax), s		39.0				39.0	14.0
Max Q Clear Time (g_c+l1), s		2.0				4.0	8.6
Green Ext Time (p_c), s		18.3				17.8	0.4
Intersection Summary							
HCM 2010 Ctrl Delay			4.6				
HCM 2010 LOS			Α				

	۶	<b>→</b>	•	✓	<b>←</b>	•	1	†	~	<b>/</b>	<b></b>	4
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	75	<b>∱</b> ∱		7	ħβ		7	ħβ		7	<b>^</b>	7
Volume (veh/h)	387	618	267	25	309	31	97	307	13	65	503	296
Number	3	8	18	7	4	14	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1810	1810	1900	1827	1827	1900	1792	1792	1900	1827	1827	1827
Adj Flow Rate, veh/h	430	687	297	28	343	34	108	341	14	72	559	329
Adj No. of Lanes	1	2	0	1	2	0	1	2	0	1	2	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	5	5	5	4	4	4	6	6	6	4	4	4
Cap, veh/h	501	1010	437	147	502	49	403	1774	73	471	1428	989
Arrive On Green	0.23	0.43	0.43	0.16	0.16	0.16	0.14	1.00	1.00	0.82	0.82	0.82
Sat Flow, veh/h	1723	2339	1011	559	3193	314	1707	3335	137	1002	3471	1553
Grp Volume(v), veh/h	430	505	479	28	185	192	108	174	181	72	559	329
Grp Sat Flow(s),veh/h/ln	1723	1719	1631	559	1736	1771	1707	1703	1768	1002	1736	1553
Q Serve(g_s), s	24.5	28.9	28.9	5.4	12.3	12.5	4.1	0.0	0.0	1.8	5.2	4.9
Cycle Q Clear(g_c), s	24.5	28.9	28.9	5.4	12.3	12.5	4.1	0.0	0.0	1.8	5.2	4.9
Prop In Lane	1.00		0.62	1.00		0.18	1.00		0.08	1.00		1.00
Lane Grp Cap(c), veh/h	501	742	704	147	273	279	403	906	941	471	1428	989
V/C Ratio(X)	0.86	0.68	0.68	0.19	0.68	0.69	0.27	0.19	0.19	0.15	0.39	0.33
Avail Cap(c_a), veh/h	675	955	906	159	312	318	406	906	941	471	1428	989
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00
Upstream Filter(I)	0.69	0.69	0.69	0.97	0.97	0.97	0.99	0.99	0.99	0.93	0.93	0.93
Uniform Delay (d), s/veh	30.9	28.0	28.0	45.8	48.7	48.8	15.3	0.0	0.0	6.6	6.8	2.7
Incr Delay (d2), s/veh	5.9	0.9	1.0	0.6	4.8	5.0	0.4	0.5	0.5	0.6	8.0	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	12.4	13.9	13.2	0.9	6.3	6.5	1.9	0.1	0.1	0.6	2.4	2.2
LnGrp Delay(d),s/veh	36.8	28.9	29.0	46.4	53.5	53.7	15.7	0.5	0.5	7.2	7.6	3.5
LnGrp LOS	D	С	С	D	D	D	В	Α	A	A	A	Α
Approach Vol, veh/h		1414			405			463			960	
Approach Delay, s/veh		31.3			53.1			4.0			6.2	
Approach LOS		С			D			Α			Α	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4		6		8				
Phs Duration (G+Y+Rc), s	14.8	56.4	33.6	25.3		71.1		58.9				
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0		6.0		6.0				
Max Green Setting (Gmax), s	9.0	35.0	40.0	22.0		50.0		68.0				
Max Q Clear Time (g_c+l1), s	6.1	7.2	26.5	14.5		2.0		30.9				
Green Ext Time (p_c), s	0.1	8.3	1.2	4.7		9.2		11.6				
Intersection Summary												
HCM 2010 Ctrl Delay			22.7									
HCM 2010 LOS			С									

	<b>*</b>	<b>→</b>	7	<b>√</b>	<b>←</b>	*	1	†	~	<b>/</b>	<b>+</b>	1
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	7	ħβ		7	ħβ		7	ħβ		ሻ	<b>^</b>	7
Volume (veh/h)	402	344	130	22	612	70	271	505	37	47	348	321
Number	3	8	18	7	4	14	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1827	1827	1900	1845	1845	1900	1827	1827	1900	1845	1845	1845
Adj Flow Rate, veh/h	447	382	144	24	680	78	301	561	41	52	387	357
Adj No. of Lanes	1	2	0	1	2	0	1	2	0	1	2	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	4	4	4	3	3	3	4	4	4	3	3	3
Cap, veh/h	476	1276	475	263	756	87	407	1369	100	234	772	704
Arrive On Green	0.23	0.51	0.51	0.24	0.24	0.24	0.30	0.83	0.83	0.29	0.29	0.29
Sat Flow, veh/h	1740	2478	922	865	3170	363	1740	3281	239	806	3505	1568
Grp Volume(v), veh/h	447	266	260	24	376	382	301	296	306	52	387	357
Grp Sat Flow(s),veh/h/ln	1740	1736	1664	865	1752	1781	1740	1736	1785	806	1752	1568
Q Serve(g_s), s	26.1	11.1	11.4	2.8	26.3	26.4	16.9	5.4	5.5	6.3	11.6	20.6
Cycle Q Clear(g_c), s	26.1	11.1	11.4	2.8	26.3	26.4	16.9	5.4	5.5	6.3	11.6	20.6
Prop In Lane	1.00		0.55	1.00		0.20	1.00		0.13	1.00		1.00
Lane Grp Cap(c), veh/h	476	894	857	263	418	424	407	724	745	234	772	704
V/C Ratio(X)	0.94	0.30	0.30	0.09	0.90	0.90	0.74	0.41	0.41	0.22	0.50	0.51
Avail Cap(c_a), veh/h	559	987	947	269	429	436	408	724	745	234	772	704
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.33	1.33	1.33
Upstream Filter(I)	0.91	0.91	0.91	0.88	0.88	0.88	0.96	0.96	0.96	0.97	0.97	0.97
Uniform Delay (d), s/veh	34.0	17.6	17.7	37.8	46.7	46.8	24.9	6.6	6.6	37.1	39.0	22.6
Incr Delay (d2), s/veh	20.7	0.2	0.2	0.1	19.2	19.1	6.7	1.6	1.6	2.1	2.3	2.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	18.0	5.4	5.2	0.7	15.0	15.2	8.8	2.7	2.8	1.6	5.9	9.4
LnGrp Delay(d),s/veh	54.6	17.8	17.8	37.9	65.9	65.9	31.6	8.2	8.2	39.3	41.3	25.1
LnGrp LOS	D	В	В	D	Е	Е	С	Α	Α	D	D	С
Approach Vol, veh/h		973			782			903			796	
Approach Delay, s/veh		34.7			65.0			16.0			33.9	
Approach LOS		С			Е			В			С	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4		6		8				
Phs Duration (G+Y+Rc), s	25.0	33.9	35.0	36.2		58.8		71.2				
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0		6.0		6.0				
Max Green Setting (Gmax), s	19.0	21.0	35.0	31.0		46.0		72.0				
Max Q Clear Time (g_c+l1), s	18.9	22.6	28.1	28.4		7.5		13.4				
Green Ext Time (p_c), s	0.0	0.0	0.9	1.8		9.7		10.7				
Intersection Summary												
HCM 2010 Ctrl Delay			36.5									
HCM 2010 LOS			D									

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4			4		7	ħβ		ሻ	<b>^</b>	7
Volume (veh/h)	15	52	118	15	44	120	26	293	18	93	568	37
Number	3	8	18	7	4	14	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1827	1900	1900	1776	1900	1810	1810	1900	1792	1792	1792
Adj Flow Rate, veh/h	17	58	131	17	49	133	29	326	20	103	631	41
Adj No. of Lanes	0	1	0	0	1	0	1	2	0	1	2	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	4	4	4	7	7	7	5	5	5	6	6	6
Cap, veh/h	46	85	169	46	73	172	612	2439	149	898	2959	1324
Arrive On Green	0.16	0.16	0.16	0.16	0.16	0.16	0.74	0.74	0.74	0.15	1.00	1.00
Sat Flow, veh/h	76	528	1056	76	456	1074	741	3292	201	1707	3406	1524
Grp Volume(v), veh/h	206	0	0	199	0	0	29	170	176	103	631	41
Grp Sat Flow(s),veh/h/ln	1660	0	0	1606	0	0	741	1719	1774	1707	1703	1524
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	1.2	3.3	3.3	1.2	0.0	0.0
Cycle Q Clear(g_c), s	13.4	0.0	0.0	13.3	0.0	0.0	1.2	3.3	3.3	1.2	0.0	0.0
Prop In Lane	0.08		0.64	0.09		0.67	1.00		0.11	1.00		1.00
Lane Grp Cap(c), veh/h	300	0	0	291	0	0	612	1274	1315	898	2959	1324
V/C Ratio(X)	0.69	0.00	0.00	0.68	0.00	0.00	0.05	0.13	0.13	0.11	0.21	0.03
Avail Cap(c_a), veh/h	721	0	0	698	0	0	612	1274	1315	1082	2959	1324
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	0.00	0.97	0.00	0.00	1.00	1.00	1.00	0.89	0.89	0.89
Uniform Delay (d), s/veh	46.2	0.0	0.0	46.2	0.0	0.0	4.0	4.3	4.3	1.7	0.0	0.0
Incr Delay (d2), s/veh	2.8	0.0	0.0	2.7	0.0	0.0	0.1	0.2	0.2	0.0	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.5	0.0	0.0	6.2	0.0	0.0	0.3	1.6	1.6	0.5	0.1	0.0
LnGrp Delay(d),s/veh	49.0	0.0	0.0	48.9	0.0	0.0	4.1	4.5	4.5	1.7	0.1	0.0
LnGrp LOS	D	0.0	0.0	D		0.0	Α	Α	А	Α	А	A
Approach Vol, veh/h		206			199			375			775	
Approach Delay, s/veh		49.0			48.9			4.5			0.3	
Approach LOS		43.0 D			D			4.0 A			Α	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		105.6		24.4	14.7	91.0		24.4				
Change Period (Y+Rc), s		6.0		6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s		69.0		49.0	21.0	42.0		49.0				
Max Q Clear Time (g_c+l1), s		2.0		15.3	3.2	5.3		15.4				
Green Ext Time (p_c), s		8.2		3.0	0.2	7.8		3.0				
Intersection Summary												
HCM 2010 Ctrl Delay			14.0									
HCM 2010 LOS			В									

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4			4		7	ħβ		7	<b>^</b>	7
Volume (veh/h)	58	53	50	16	70	155	77	552	30	90	358	61
Number	3	8	18	7	4	14	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1900	1810	1900	1827	1827	1900	1827	1827	1827
Adj Flow Rate, veh/h	64	59	56	18	78	172	86	613	33	100	398	68
Adj No. of Lanes	0	1	0	0	1	0	1	2	0	1	2	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	5	5	5	4	4	4	4	4	4
Cap, veh/h	106	96	73	44	105	209	669	2254	121	647	2763	1236
Arrive On Green	0.20	0.20	0.20	0.20	0.20	0.20	0.67	0.67	0.67	0.15	1.00	1.00
Sat Flow, veh/h	328	487	371	61	529	1058	905	3351	180	1740	3471	1553
Grp Volume(v), veh/h	179	0	0	268	0	0	86	317	329	100	398	68
Grp Sat Flow(s), veh/h/ln	1186	0	0	1649	0	0	905	1736	1795	1740	1736	1553
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	4.1	8.7	8.7	1.7	0.0	0.0
Cycle Q Clear(g_c), s	18.3	0.0	0.0	18.2	0.0	0.0	4.1	8.7	8.7	1.7	0.0	0.0
Prop In Lane	0.36	0.0	0.31	0.07	0.0	0.64	1.00	0.7	0.10	1.00	0.0	1.00
Lane Grp Cap(c), veh/h	276	0	0.01	358	0	0.01	669	1167	1207	647	2763	1236
V/C Ratio(X)	0.65	0.00	0.00	0.75	0.00	0.00	0.13	0.27	0.27	0.15	0.14	0.06
Avail Cap(c_a), veh/h	550	0.00	0.00	658	0.00	0.00	669	1167	1207	740	2763	1236
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	0.00	0.98	0.00	0.00	1.00	1.00	1.00	0.80	0.80	0.80
Uniform Delay (d), s/veh	44.5	0.0	0.0	45.7	0.0	0.0	7.0	7.8	7.8	3.8	0.0	0.0
Incr Delay (d2), s/veh	2.6	0.0	0.0	3.1	0.0	0.0	0.4	0.6	0.6	0.1	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.8	0.0	0.0	8.7	0.0	0.0	1.1	4.3	4.5	0.8	0.0	0.0
LnGrp Delay(d),s/veh	47.1	0.0	0.0	48.7	0.0	0.0	7.4	8.4	8.3	3.9	0.1	0.1
LnGrp LOS	D	0.0	0.0	D	0.0	0.0	Α	A	Α	Α	A	A
Approach Vol, veh/h		179			268		71	732	7.	71	566	
Approach Delay, s/veh		47.1			48.7			8.2			0.8	
Approach LOS		D			40.7 D			Α			Α	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		100.5		29.5	14.7	85.9		29.5				
Change Period (Y+Rc), s		6.0		6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s		72.0		46.0	15.0	51.0		46.0				
Max Q Clear Time (g_c+I1), s		2.0		20.2	3.7	10.7		20.3				
Green Ext Time (p_c), s		9.2		3.2	0.2	8.9		3.2				
Intersection Summary												
HCM 2010 Ctrl Delay			16.0									
HCM 2010 LOS			В									

Intersection							
Intersection Int Delay, s/veh	2.2						
init Delay, S/ven	2.2						
Movement	WBL	WBR		NBT	NBR	SBL	SBT
Vol, veh/h	0	233		139	19	379	340
Conflicting Peds, #/hr	0	0		0	0	0	0
Sign Control	Stop	Stop		Free	Free	Free	Free
RT Channelized	- -	None		-	None	-	None
Storage Length	_	0		-	-	250	-
Veh in Median Storage, #	0	-		0	_	-	0
Grade, %	0	-		0	_	-	0
Peak Hour Factor	90	90		90	90	90	90
Heavy Vehicles, %	8	8		2	2	5	5
Mvmt Flow	0	259		154	21	421	378
		200		101	<u> </u>	T£.1	070
Major/Minor	Minor1			Major1		Major2	
Conflicting Flow All	1196	88		0	0	176	0
Stage 1	165	-		-	-	-	-
Stage 2	1031	-		-	-	-	-
Critical Hdwy	6.96	7.06		-	-	4.2	-
Critical Hdwy Stg 1	5.96	-		-	-	-	-
Critical Hdwy Stg 2	5.96	-		-	-	-	-
Follow-up Hdwy	3.58	3.38		-	-	2.25	-
Pot Cap-1 Maneuver	170	934		-	-	1376	-
Stage 1	830	-		-	-	-	-
Stage 2	292	-		-	-	-	-
Platoon blocked, %				-	-		-
Mov Cap-1 Maneuver	118	934		-	-	1376	-
Mov Cap-2 Maneuver	177	-		-	-	-	-
Stage 1	830	-		-	-	-	-
Stage 2	203	-		-	-	-	-
Approach	WB			NB		SB	
HCM Control Delay, s	10.3						
HCM LOS	В						
Minor Lane/Major Mvmt	NBT	NBR WBLn1	SBL	SBT			
Capacity (veh/h)	-	- 934	1376	-			
HCM Control Dolon (a)	-	- 0.277	0.306	-			
HCM Control Delay (s)	-	- 10.3	8.8	-			
HCM Lane LOS	-	- B	A	-			
HCM 95th %tile Q(veh)	-	- 1	1	-			

Intersection	1.0						
nt Delay, s/veh	4.3						
Movement	WBL	WBR		NBT	NBR	SBL	SBT
Vol, veh/h	0	338		299		231	146
Conflicting Peds, #/hr	0	0		(		0	0
Sign Control	Stop	Stop		Free	Free	Free	Free
RT Channelized	·-	None			- None	-	None
Storage Length	-	0				250	-
Veh in Median Storage, #	0	-		(	) -	-	0
Grade, %	0	-		(	) -	-	0
Peak Hour Factor	90	90		90	90	90	90
Heavy Vehicles, %	7	7		2	2 2	4	4
Mvmt Flow	0	376		332	2 37	257	162
Major/Minor	Minor1			Major1	<u> </u>	Major2	
Conflicting Flow All	945	184		C	0	369	0
Stage 1	351	-				-	-
Stage 2	594	-				-	-
Critical Hdwy	6.94	7.04				4.18	-
Critical Hdwy Stg 1	5.94	-				-	-
Critical Hdwy Stg 2	5.94	-				-	-
Follow-up Hdwy	3.57	3.37				2.24	-
Pot Cap-1 Maneuver	251	811				1172	-
Stage 1	669	-		•		-	-
Stage 2	501	-				-	-
Platoon blocked, %							-
Mov Cap-1 Maneuver	196	811				1172	-
Mov Cap-2 Maneuver	305	-				-	-
Stage 1	669	-				-	-
Stage 2	391	-			-	-	-
Approach	WB			NE	3	SB	
HCM Control Delay, s	13.2			142			
HCM LOS	В						
Minor Lane/Major Mvmt	NBT	NBR WBLn1	SBL	SBT			
Capacity (veh/h)	-	- 811	1172	-			
HCM Lane V/C Ratio	-	- 0.463	0.219	-			
HCM Control Delay (s)	-	- 13.2	8.9	-			
HCM Lane LOS	-	- B	Α	-			
HCM 95th %tile Q(veh)	-	- 2	1	-			

	۶	<b>→</b>	•	<b>*</b>	<b>←</b>	*	1	†	~	<b>\</b>	Ţ	4
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4			4	7	7	<b>†</b>	7	7	ĵ.	
Volume (veh/h)	4	55	4	31	6	31	4	181	8	80	322	5
Number	3	8	18	7	4	14	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1900	1810	1810	1776	1776	1776	1759	1759	1900
Adj Flow Rate, veh/h	4	61	4	34	7	34	4	201	9	89	358	6
Adj No. of Lanes	0	1	0	0	1	1	1	1	1	1	1	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	5	5	5	7	7	7	8	8	8
Cap, veh/h	102	535	33	510	90	485	400	695	591	522	675	11
Arrive On Green	0.32	0.32	0.32	0.32	0.32	0.32	0.39	0.39	0.39	0.39	0.39	0.39
Sat Flow, veh/h	28	1699	106	1108	286	1538	966	1776	1509	1102	1725	29
Grp Volume(v), veh/h	69	0	0	41	0	34	4	201	9	89	0	364
Grp Sat Flow(s),veh/h/ln	1834	0	0	1394	0	1538	966	1776	1509	1102	0	1754
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	0.6	0.1	3.2	0.1	2.5	0.0	6.5
Cycle Q Clear(g_c), s	1.1	0.0	0.0	0.7	0.0	0.6	6.6	3.2	0.1	5.6	0.0	6.5
Prop In Lane	0.06		0.06	0.83		1.00	1.00		1.00	1.00		0.02
Lane Grp Cap(c), veh/h	671	0	0	600	0	485	400	695	591	522	0	687
V/C Ratio(X)	0.10	0.00	0.00	0.07	0.00	0.07	0.01	0.29	0.02	0.17	0.00	0.53
Avail Cap(c_a), veh/h	897	0	0	770	0	677	731	1303	1108	899	0	1287
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	10.0	0.0	0.0	9.8	0.0	9.8	12.1	8.5	7.6	10.5	0.0	9.6
Incr Delay (d2), s/veh	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.2	0.0	0.2	0.0	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	0.0	0.0	0.3	0.0	0.3	0.0	1.6	0.1	0.8	0.0	3.3
LnGrp Delay(d),s/veh	10.0	0.0	0.0	9.9	0.0	9.9	12.1	8.8	7.6	10.6	0.0	10.2
LnGrp LOS	В			Α		Α	В	Α	Α	В		В
Approach Vol, veh/h		69			75			214			453	
Approach Delay, s/veh		10.0			9.9			8.8			10.3	
Approach LOS		В			А			А			В	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		22.0		18.9		22.0		18.9				
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0				
Max Green Setting (Gmax), s		30.0		18.0		30.0		18.0				
Max Q Clear Time (g_c+l1), s		8.5		2.7		8.6		3.1				
Green Ext Time (p_c), s		3.8		0.6		3.7		0.5				
Intersection Summary												
HCM 2010 Ctrl Delay			9.8									
HCM 2010 LOS			Α									

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4			4	7	7	<b>†</b>	7	7	ĵ»	
Volume (veh/h)	4	7	4	10	27	63	4	300	18	43	226	4
Number	3	8	18	7	4	14	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1900	1810	1810	1810	1810	1810	1776	1776	1900
Adj Flow Rate, veh/h	4	8	4	11	30	70	4	333	20	48	251	4
Adj No. of Lanes	0	1	0	0	1	1	1	1	1	1	1	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	5	5	5	5	5	5	7	7	7
Cap, veh/h	184	309	127	197	436	464	503	722	613	436	695	11
Arrive On Green	0.30	0.30	0.30	0.30	0.30	0.30	0.40	0.40	0.40	0.40	0.40	0.40
Sat Flow, veh/h	238	1024	421	275	1442	1538	1088	1810	1538	976	1743	28
Grp Volume(v), veh/h	16	0	0	41	0	70	4	333	20	48	0	255
Grp Sat Flow(s), veh/h/ln	1683	0	0	1718	0	1538	1088	1810	1538	976	0	1771
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	1.3	0.1	5.4	0.3	1.5	0.0	4.1
Cycle Q Clear(g_c), s	0.3	0.0	0.0	0.6	0.0	1.3	4.2	5.4	0.3	7.0	0.0	4.1
Prop In Lane	0.25		0.25	0.27		1.00	1.00		1.00	1.00		0.02
Lane Grp Cap(c), veh/h	620	0	0	633	0	464	503	722	613	436	0	706
V/C Ratio(X)	0.03	0.00	0.00	0.06	0.00	0.15	0.01	0.46	0.03	0.11	0.00	0.36
Avail Cap(c_a), veh/h	857	0	0	876	0	690	883	1353	1150	777	0	1324
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	9.9	0.0	0.0	10.0	0.0	10.2	9.9	8.9	7.3	11.4	0.0	8.5
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.5	0.0	0.1	0.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.0	0.3	0.0	0.6	0.0	2.8	0.1	0.4	0.0	2.0
LnGrp Delay(d),s/veh	9.9	0.0	0.0	10.0	0.0	10.4	9.9	9.3	7.4	11.6	0.0	8.8
LnGrp LOS	Α			В		В	Α	Α	Α	В		Α
Approach Vol, veh/h		16			111			357			303	
Approach Delay, s/veh		9.9			10.3			9.2			9.2	
Approach LOS		Α			В			Α			Α	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		22.0		18.1		22.0		18.1				
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0				
Max Green Setting (Gmax), s		30.0		18.0		30.0		18.0				
Max Q Clear Time (g_c+l1), s		9.0		3.3		7.4		2.3				
Green Ext Time (p_c), s		3.7		0.4		3.8		0.4				
Intersection Summary												
HCM 2010 Ctrl Delay			9.4									
HCM 2010 LOS			Α									

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Movement	WBL	WBR	NBT	NBR	SBL	SBT		
Lane Configurations	767	7	<b>∱</b> }		*	<b>^</b>		
Volume (veh/h)	9	14	183	16	17	342		
Number	3	18	2	12	1	6		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1667	1667	1810	1900	1776	1776		
Adj Flow Rate, veh/h	10	16	203	18	19	380		
Adj No. of Lanes	2	1	2	0	1	2		
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90		
Percent Heavy Veh, %	14	14	5	5	7	7		
Cap, veh/h	180	83	1720	151	800	1815		
Arrive On Green	0.06	0.06	0.54	0.54	0.54	0.54		
Sat Flow, veh/h	3079	1417	3288	281	1101	3463		
Grp Volume(v), veh/h	10	16	108	113	19	380		
Grp Sat Flow(s), veh/h/ln	1540	1417	1719	1760	1101	1687		
Q Serve(g_s), s	0.1	0.3	0.9	0.9	0.3	1.7		
Cycle Q Clear(g_c), s	0.1	0.3	0.9	0.9	1.2	1.7		
Prop In Lane	1.00	1.00	0.0	0.16	1.00	1.7		
Lane Grp Cap(c), veh/h	180	83	925	947	800	1815		
V/C Ratio(X)	0.06	0.19	0.12	0.12	0.02	0.21		
Avail Cap(c_a), veh/h	1657	762	1850	1894	1392	3630		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	13.2	13.3	3.4	3.4	3.7	3.6		
Incr Delay (d2), s/veh	0.1	1.1	0.1	0.1	0.0	0.1		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.4	0.5	0.1	0.8		
LnGrp Delay(d),s/veh	13.4	14.5	3.4	3.4	3.7	3.6		
LnGrp LOS	В	В	Α.4	Α	Α	3.0 A		
Approach Vol, veh/h	26	- 0	221	7.	- / \	399		
Approach Vol, ven/n	14.0		3.4			3.6		
Approach LOS	14.0 B		3.4 A			3.0 A		
	D							
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		22.0				22.0	7.	
Change Period (Y+Rc), s		6.0				6.0	6.	
Max Green Setting (Gmax), s		32.0				32.0	16.	
Max Q Clear Time (g_c+l1), s		2.9				3.7	2.	
Green Ext Time (p_c), s		4.0				4.0	0.	0
Intersection Summary								
HCM 2010 Ctrl Delay			4.0					
HCM 2010 LOS			Α					

Movement WBL WBR NBT NBR SBL SBT
Lane Configurations ሻሻ ተ
Volume (veh/h) 6 12 322 24 19 240
Number 3 18 2 12 1 6
nitial Q (Qb), veh 0 0 0 0 0
Ped-Bike Adj(A_pbT) 1.00 1.00 1.00 1.00
Parking Bus, Adj 1.00 1.00 1.00 1.00 1.00
Adj Sat Flow, veh/h/ln 1712 1712 1827 1900 1810 1810
Adj Flow Rate, veh/h 7 13 358 27 21 267
Adj No. of Lanes 2 1 2 0 1 2
Peak Hour Factor 0.90 0.90 0.90 0.90 0.90
Percent Heavy Veh, % 11 11 4 4 5 5
Cap, veh/h 146 67 1784 134 718 1874
Arrive On Green 0.05 0.05 0.55 0.55 0.55
Sat Flow, veh/h 3163 1455 3365 246 966 3529
Grp Volume(v), veh/h 7 13 189 196 21 267
Grp Sat Flow(s), veh/h/ln 1581 1455 1736 1784 966 1719
Q Serve(g_s), s 0.1 0.3 1.6 1.6 0.3 1.1
Cycle Q Clear(g_c), s 0.1 0.3 1.6 1.6 2.0 1.1
Prop In Lane 1.00 1.00 0.14 1.00
ane Grp Cap(c), veh/h 146 67 946 972 718 1874
V/C Ratio(X) 0.05 0.19 0.20 0.20 0.03 0.14
Avail Cap(c_a), veh/h 1724 793 1892 1944 1244 3748
HCM Platoon Ratio 1.00 1.00 1.00 1.00 1.00 1.00
Jpstream Filter(I) 1.00 1.00 1.00 1.00 1.00
Uniform Delay (d), s/veh 13.4 13.5 3.4 3.4 3.9 3.3
ncr Delay (d2), s/veh 0.1 1.4 0.1 0.1 0.0 0.0
Initial Q Delay(d3),s/veh 0.0 0.0 0.0 0.0 0.0
%ile BackOfQ(50%),veh/ln 0.0 0.1 0.8 0.8 0.1 0.5
LnGrp Delay(d),s/veh 13.5 14.9 3.5 3.5 3.9 3.3
_nGrp LOS B B A A A A
Approach Vol, veh/h 20 385 288
Approach Delay, s/veh 14.4 3.5 3.4
pproach LOS B A A
imer 1 2 3 4 5 6 7 8
Assigned Phs 2 6 8
Phs Duration (G+Y+Rc), s 22.0 22.0 7.4
Change Period (Y+Rc), s 6.0 6.0 6.0
Max Green Setting (Gmax), s 32.0 32.0 16.0
Max Q Clear Time (g_c+l1), s 3.6 4.0 2.3
Green Ext Time (p_c), s 4.3 4.3 0.0
ntersection Summary
CM 2010 Ctrl Delay 3.8
HCM 2010 LOS A

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	7	ĵ.		7	f)		7	f)		7	ĵ.	
Volume (veh/h)	12	175	72	90	108	10	19	54	120	17	119	12
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1810	1810	1900	1810	1810	1900	1696	1696	1900	1863	1863	1900
Adj Flow Rate, veh/h	13	194	80	100	120	11	21	60	133	19	132	13
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	5	5	5	5	5	5	12	12	12	2	2	2
Cap, veh/h	467	341	141	495	833	76	372	132	292	333	467	46
Arrive On Green	0.28	0.28	0.28	0.13	0.51	0.51	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	1218	1218	502	1723	1633	150	1127	470	1042	1185	1669	164
Grp Volume(v), veh/h	13	0	274	100	0	131	21	0	193	19	0	145
Grp Sat Flow(s),veh/h/ln	1218	0	1721	1723	0	1783	1127	0	1512	1185	0	1834
Q Serve(g_s), s	0.4	0.0	7.8	2.0	0.0	2.2	0.8	0.0	6.0	0.8	0.0	3.5
Cycle Q Clear(g_c), s	0.4	0.0	7.8	2.0	0.0	2.2	4.4	0.0	6.0	6.8	0.0	3.5
Prop In Lane	1.00		0.29	1.00		0.08	1.00		0.69	1.00		0.09
Lane Grp Cap(c), veh/h	467	0	481	495	0	909	372	0	424	333	0	513
V/C Ratio(X)	0.03	0.00	0.57	0.20	0.00	0.14	0.06	0.00	0.46	0.06	0.00	0.28
Avail Cap(c_a), veh/h	851	0	1024	641	0	1623	569	0	688	540	0	834
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	15.0	0.0	17.6	10.4	0.0	7.4	17.8	0.0	17.0	19.8	0.0	16.1
Incr Delay (d2), s/veh	0.0	0.0	1.1	0.2	0.0	0.1	0.1	0.0	0.8	0.1	0.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	3.8	0.9	0.0	1.1	0.3	0.0	2.6	0.3	0.0	1.8
LnGrp Delay(d),s/veh	15.0	0.0	18.7	10.6	0.0	7.5	17.9	0.0	17.7	19.8	0.0	16.4
LnGrp LOS	В		В	В		Α	В		В	В		В
Approach Vol, veh/h		287			231			214			164	
Approach Delay, s/veh		18.5			8.8			17.8			16.8	
Approach LOS		В			A			В			В	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	13.2	22.0		22.0		35.1		22.0				
Change Period (Y+Rc), s	6.0	6.0		6.0		6.0		6.0				
Max Green Setting (Gmax), s	12.0	34.0		26.0		52.0		26.0				
Max Q Clear Time (g_c+l1), s	4.0	9.8		8.8		4.2		8.0				
Green Ext Time (p_c), s	0.1	2.5		2.0		2.8		2.0				
Intersection Summary												
HCM 2010 Ctrl Delay			15.5									
HCM 2010 LOS			13.3 B									
1101VI 2010 LOS			D									

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	7	f)		7	f)		7	f)		ሻ	f)	
Volume (veh/h)	13	102	44	97	173	15	46	114	105	5	45	13
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1827	1827	1900	1827	1827	1900	1712	1712	1900	1863	1863	1900
Adj Flow Rate, veh/h	14	113	49	108	192	17	51	127	117	6	50	14
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	4	4	4	4	4	4	11	11	11	2	2	2
Cap, veh/h	444	337	146	594	847	75	434	229	211	292	391	109
Arrive On Green	0.28	0.28	0.28	0.13	0.51	0.51	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	1146	1210	525	1740	1655	146	1224	821	757	1131	1401	392
Grp Volume(v), veh/h	14	0	162	108	0	209	51	0	244	6	0	64
Grp Sat Flow(s),veh/h/ln	1146	0	1734	1740	0	1801	1224	0	1578	1131	0	1794
Q Serve(g_s), s	0.5	0.0	4.3	2.1	0.0	3.7	1.9	0.0	7.6	0.3	0.0	1.5
Cycle Q Clear(g_c), s	0.5	0.0	4.3	2.1	0.0	3.7	3.4	0.0	7.6	7.8	0.0	1.5
Prop In Lane	1.00		0.30	1.00		0.08	1.00		0.48	1.00		0.22
Lane Grp Cap(c), veh/h	444	0	483	594	0	922	434	0	440	292	0	500
V/C Ratio(X)	0.03	0.00	0.34	0.18	0.00	0.23	0.12	0.00	0.55	0.02	0.00	0.13
Avail Cap(c_a), veh/h	645	0	786	764	0	1413	797	0	908	627	0	1032
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	15.1	0.0	16.5	9.9	0.0	7.7	16.7	0.0	17.6	21.0	0.0	15.5
Incr Delay (d2), s/veh	0.0	0.0	0.4	0.1	0.0	0.1	0.1	0.0	1.1	0.0	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	2.1	1.0	0.0	1.8	0.6	0.0	3.4	0.1	0.0	0.8
LnGrp Delay(d),s/veh	15.1	0.0	16.9	10.0	0.0	7.9	16.8	0.0	18.7	21.0	0.0	15.6
LnGrp LOS	В		В	В		Α	В		В	С		В
Approach Vol, veh/h		176			317			295			70	
Approach Delay, s/veh		16.7			8.6			18.4			16.0	
Approach LOS		В			Α			В			В	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	13.4	22.0		22.0		35.4		22.0				
Change Period (Y+Rc), s	6.0	6.0		6.0		6.0		6.0				
Max Green Setting (Gmax), s	13.0	26.0		33.0		45.0		33.0				
Max Q Clear Time (g_c+I1), s	4.1	6.3		9.8		5.7		9.6				
Green Ext Time (p_c), s	0.1	2.2		2.1		2.5		2.1				
Intersection Summary												
HCM 2010 Ctrl Delay			14.2									
HCM 2010 LOS			В									

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	7	<b>†</b>	7	7	<b>∱</b> ∱		7	<b>↑</b>	7	7	<b>^</b>	7
Volume (veh/h)	161	39	249	50	47	32	118	297	72	76	485	127
Number	3	8	18	7	4	14	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1827	1827	1827	1863	1863	1900	1727	1727	1727	1727	1727	1727
Adj Flow Rate, veh/h	179	43	277	56	52	36	131	330	80	84	539	141
Adj No. of Lanes	1	1	1	1	2	0	1	1	1	1	1	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	4	4	4	2	2	2	10	10	10	10	10	10
Cap, veh/h	436	488	415	384	557	352	345	919	782	500	919	782
Arrive On Green	0.27	0.27	0.27	0.27	0.27	0.27	0.53	0.53	0.53	0.53	0.53	0.53
Sat Flow, veh/h	1279	1827	1553	1055	2084	1316	702	1727	1468	901	1727	1468
Grp Volume(v), veh/h	179	43	277	56	43	45	131	330	80	84	539	141
Grp Sat Flow(s),veh/h/ln	1279	1827	1553	1055	1770	1630	702	1727	1468	901	1727	1468
Q Serve(g_s), s	7.3	1.1	9.5	2.5	1.1	1.2	9.3	6.6	1.6	3.6	12.7	3.0
Cycle Q Clear(g_c), s	8.6	1.1	9.5	3.6	1.1	1.2	22.0	6.6	1.6	10.2	12.7	3.0
Prop In Lane	1.00		1.00	1.00		0.81	1.00	0.0	1.00	1.00		1.00
Lane Grp Cap(c), veh/h	436	488	415	384	473	436	345	919	782	500	919	782
V/C Ratio(X)	0.41	0.09	0.67	0.15	0.09	0.10	0.38	0.36	0.10	0.17	0.59	0.18
Avail Cap(c_a), veh/h	585	702	597	507	680	626	499	1298	1104	698	1298	1104
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.8	16.5	19.6	17.8	16.5	16.5	17.0	8.1	6.9	11.0	9.5	7.2
Incr Delay (d2), s/veh	0.6	0.1	1.9	0.2	0.1	0.1	0.7	0.2	0.1	0.2	0.6	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.7	0.5	4.3	0.7	0.5	0.6	1.8	3.2	0.7	0.9	6.1	1.2
LnGrp Delay(d),s/veh	20.4	16.5	21.4	18.0	16.6	16.6	17.7	8.3	7.0	11.2	10.1	7.4
LnGrp LOS	С	В	С	В	В	В	В	A	A	В	В	Α
Approach Vol, veh/h	-	499			144			541			764	
Approach Delay, s/veh		20.6			17.1			10.4			9.7	
Approach LOS		C			В			В			A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		37.9		22.0		37.9		22.0				
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0				
Max Green Setting (Gmax), s		45.0		23.0		45.0		23.0				
Max Q Clear Time (g_c+l1), s		14.7		5.6		24.0		11.5				
Green Ext Time (p_c), s		8.9		2.4		7.8		2.1				
Intersection Summary												
HCM 2010 Ctrl Delay			13.3									
HCM 2010 LOS			В									

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	7	<b></b>	7	7	<b>∱</b> }		*	<b></b>	7	*	<b>+</b>	7
Volume (veh/h)	135	36	138	77	42	81	265	518	53	34	317	173
Number	3	8	18	7	4	14	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1863	1863	1900	1759	1759	1759	1759	1759	1759
Adj Flow Rate, veh/h	150	40	153	86	47	90	294	576	59	38	352	192
Adj No. of Lanes	1	1	1	1	2	0	1	1	1	1	1	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	3	3	3	2	2	2	8	8	8	8	8	8
Cap, veh/h	354	449	381	378	431	385	489	1010	859	383	1010	859
Arrive On Green	0.24	0.24	0.24	0.24	0.24	0.24	0.57	0.57	0.57	0.57	0.57	0.57
Sat Flow, veh/h	1235	1845	1568	1185	1770	1583	811	1759	1495	746	1759	1495
Grp Volume(v), veh/h	150	40	153	86	47	90	294	576	59	38	352	192
Grp Sat Flow(s),veh/h/ln	1235	1845	1568	1185	1770	1583	811	1759	1495	746	1759	1495
Q Serve(g_s), s	7.3	1.1	5.4	4.0	1.4	3.0	19.9	13.6	1.2	2.2	7.0	4.1
Cycle Q Clear(g_c), s	10.3	1.1	5.4	5.1	1.4	3.0	26.9	13.6	1.2	15.9	7.0	4.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	354	449	381	378	431	385	489	1010	859	383	1010	859
V/C Ratio(X)	0.42	0.09	0.40	0.23	0.11	0.23	0.60	0.57	0.07	0.10	0.35	0.22
Avail Cap(c_a), veh/h	429	561	477	450	538	482	615	1284	1091	499	1284	1091
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.1	19.2	20.9	21.2	19.3	20.0	14.6	8.9	6.2	13.9	7.5	6.8
Incr Delay (d2), s/veh	0.8	0.1	0.7	0.3	0.1	0.3	1.2	0.5	0.0	0.1	0.2	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	0.6	2.4	1.3	0.7	1.3	4.6	6.7	0.5	0.5	3.4	1.7
LnGrp Delay(d),s/veh	24.9	19.3	21.5	21.5	19.5	20.3	15.8	9.4	6.2	14.0	7.7	7.0
LnGrp LOS	С	В	С	С	В	С	В	Α	Α	В	Α	Α
Approach Vol, veh/h		343			223			929			582	
Approach Delay, s/veh		22.8			20.6			11.2			7.8	
Approach LOS		С			С			В			Α	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		43.8		22.0		43.8		22.0				
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0				
Max Green Setting (Gmax), s		48.0		20.0		48.0		20.0				
Max Q Clear Time (g_c+l1), s		17.9		7.1		28.9		12.3				
Green Ext Time (p_c), s		10.8		2.0		8.9		1.6				
Intersection Summary												
HCM 2010 Ctrl Delay			13.2									
HCM 2010 LOS			В									

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	1,4	<b>^</b>	7	7	£		7	4î		7	<b>^</b>	7
Volume (veh/h)	312	97	198	4	42	4	93	228	4	4	441	241
Number	3	8	18	7	4	14	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1827	950	1827	950	950	1900	1759	1736	1900	950	1727	1727
Adj Flow Rate, veh/h	347	108	220	4	47	4	103	253	4	4	490	268
Adj No. of Lanes	2	1	1	1	1	0	1	1	0	1	1	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	4	100	4	100	100	100	8	8	8	100	10	10
Cap, veh/h	444	386	631	197	173	15	238	756	12	288	766	844
Arrive On Green	0.13	0.41	0.41	0.20	0.20	0.20	0.44	0.44	0.44	0.44	0.44	0.44
Sat Flow, veh/h	3375	950	1553	534	864	73	665	1705	27	570	1727	1468
Grp Volume(v), veh/h	347	108	220	4	0	51	103	0	257	4	490	268
Grp Sat Flow(s),veh/h/ln	1688	950	1553	534	0	937	665	0	1731	570	1727	1468
Q Serve(g_s), s	8.0	6.1	7.8	0.5	0.0	3.7	11.4	0.0	7.8	0.4	17.6	7.6
Cycle Q Clear(g_c), s	8.0	6.1	7.8	0.5	0.0	3.7	29.0	0.0	7.8	8.1	17.6	7.6
Prop In Lane	1.00		1.00	1.00		0.08	1.00		0.02	1.00		1.00
Lane Grp Cap(c), veh/h	444	386	631	197	0	187	238	0	768	288	766	844
V/C Ratio(X)	0.78	0.28	0.35	0.02	0.00	0.27	0.43	0.00	0.33	0.01	0.64	0.32
Avail Cap(c_a), veh/h	633	439	718	197	0	187	284	0	888	327	885	946
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	33.6	15.9	16.4	25.8	0.0	27.1	28.6	0.0	14.5	17.2	17.3	8.8
Incr Delay (d2), s/veh	4.1	0.4	0.3	0.0	0.0	0.8	1.2	0.0	0.3	0.0	1.2	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.0	1.6	3.4	0.1	0.0	1.0	2.2	0.0	3.8	0.1	8.6	3.1
LnGrp Delay(d),s/veh	37.7	16.3	16.7	25.8	0.0	27.8	29.8	0.0	14.8	17.2	18.5	9.1
LnGrp LOS	D	В	В	С		С	С		В	В	В	Α
Approach Vol, veh/h		675			55			360			762	
Approach Delay, s/veh		27.4			27.7			19.1			15.2	
Approach LOS		С			С			В			В	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2	3	4		6		8				
Phs Duration (G+Y+Rc), s		41.5	16.5	22.0		41.5		38.5				
Change Period (Y+Rc), s		6.0	6.0	6.0		6.0		6.0				
Max Green Setting (Gmax), s		41.0	15.0	16.0		41.0		37.0				
Max Q Clear Time (g_c+l1), s		19.6	10.0	5.7		31.0		9.8				
Green Ext Time (p_c), s		6.5	0.6	1.3		4.4		1.8				
Intersection Summary												
HCM 2010 Ctrl Delay			20.8									
HCM 2010 LOS			С									

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	1,4	<b>†</b>	7	7	f)		7	f)		7	<b>†</b>	7
Volume (veh/h)	325	42	91	12	89	4	234	475	4	4	262	317
Number	3	8	18	7	4	14	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	950	1845	950	950	1900	1776	1764	1900	950	1759	1759
Adj Flow Rate, veh/h	361	47	101	13	99	4	260	528	4	4	291	352
Adj No. of Lanes	2	1	1	1	1	0	1	1	0	1	1	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	3	100	3	100	100	100	7	7	7	100	8	8
Cap, veh/h	443	367	605	201	169	7	360	829	6	193	834	903
Arrive On Green	0.13	0.39	0.39	0.19	0.19	0.19	0.47	0.47	0.47	0.47	0.47	0.47
Sat Flow, veh/h	3408	950	1568	630	907	37	747	1749	13	443	1759	1495
Grp Volume(v), veh/h	361	47	101	13	0	103	260	0	532	4	291	352
Grp Sat Flow(s),veh/h/ln	1704	950	1568	630	0	944	747	0	1762	443	1759	1495
Q Serve(g_s), s	8.8	2.7	3.6	1.5	0.0	8.6	28.9	0.0	19.5	0.6	8.9	10.5
Cycle Q Clear(g_c), s	8.8	2.7	3.6	1.5	0.0	8.6	37.8	0.0	19.5	20.1	8.9	10.5
Prop In Lane	1.00		1.00	1.00		0.04	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	443	367	605	201	0	176	360	0	836	193	834	903
V/C Ratio(X)	0.82	0.13	0.17	0.06	0.00	0.59	0.72	0.00	0.64	0.02	0.35	0.39
Avail Cap(c_a), veh/h	516	410	676	216	0	198	363	0	842	195	841	909
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	36.3	17.0	17.3	29.0	0.0	31.9	26.1	0.0	17.0	24.6	14.2	8.8
Incr Delay (d2), s/veh	8.6	0.2	0.1	0.1	0.0	3.5	6.8	0.0	1.6	0.0	0.2	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.7	0.7	1.6	0.3	0.0	2.4	6.6	0.0	9.8	0.1	4.3	4.4
LnGrp Delay(d),s/veh	44.9	17.2	17.4	29.2	0.0	35.4	32.9	0.0	18.6	24.6	14.5	9.1
LnGrp LOS	D	В	В	С		D	С		В	С	В	Α
Approach Vol, veh/h		509			116			792			647	
Approach Delay, s/veh		36.9			34.7			23.3			11.6	
Approach LOS		D			С			С			В	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2	3	4		6		8				
Phs Duration (G+Y+Rc), s		46.7	17.1	22.0		46.7		39.1				
Change Period (Y+Rc), s		6.0	6.0	6.0		6.0		6.0				
Max Green Setting (Gmax), s		41.0	13.0	18.0		41.0		37.0				
Max Q Clear Time (g_c+l1), s		22.1	10.8	10.6		39.8		5.6				
Green Ext Time (p_c), s		8.2	0.3	0.8		0.9		1.5				
Intersection Summary												
HCM 2010 Ctrl Delay			23.6									
HCM 2010 LOS			С									

	۶	<b>→</b>	<b>*</b>	•	<b>←</b>	*	4	†	~	<b>/</b>	<b>↓</b>	4
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4		7	f)		7	f)		7	ĵ.	
Volume (veh/h)	45	36	88	5	23	6	68	295	15	7	557	107
Number	3	8	18	7	4	14	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1776	1900	1810	1810	1900	1776	1776	1900	1759	1759	1900
Adj Flow Rate, veh/h	50	40	98	6	26	7	76	328	17	8	619	119
Adj No. of Lanes	0	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	7	7	7	5	5	5	7	7	7	8	8	8
Cap, veh/h	134	110	191	386	328	88	288	971	50	574	832	160
Arrive On Green	0.24	0.24	0.24	0.24	0.24	0.24	0.58	0.58	0.58	0.58	0.58	0.58
Sat Flow, veh/h	272	463	801	1210	1374	370	684	1674	87	974	1435	276
Grp Volume(v), veh/h	188	0	0	6	0	33	76	0	345	8	0	738
Grp Sat Flow(s),veh/h/ln	1537	0	0	1210	0	1744	684	0	1760	974	0	1711
Q Serve(g_s), s	1.8	0.0	0.0	0.0	0.0	1.0	6.1	0.0	6.8	0.3	0.0	21.1
Cycle Q Clear(g_c), s	6.7	0.0	0.0	0.3	0.0	1.0	27.2	0.0	6.8	7.1	0.0	21.1
Prop In Lane	0.27		0.52	1.00		0.21	1.00		0.05	1.00		0.16
Lane Grp Cap(c), veh/h	435	0	0	386	0	416	288	0	1021	574	0	992
V/C Ratio(X)	0.43	0.00	0.00	0.02	0.00	0.08	0.26	0.00	0.34	0.01	0.00	0.74
Avail Cap(c_a), veh/h	531	0	0	464	0	528	491	0	1545	864	0	1501
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	21.7	0.0	0.0	19.3	0.0	19.5	20.3	0.0	7.2	9.1	0.0	10.2
Incr Delay (d2), s/veh	0.7	0.0	0.0	0.0	0.0	0.1	0.5	0.0	0.2	0.0	0.0	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.1	0.0	0.0	0.1	0.0	0.5	1.2	0.0	3.3	0.1	0.0	10.2
LnGrp Delay(d),s/veh	22.4	0.0	0.0	19.3	0.0	19.6	20.8	0.0	7.4	9.1	0.0	11.4
LnGrp LOS	С			В		В	С		Α	Α		В
Approach Vol, veh/h		188			39			421			746	
Approach Delay, s/veh		22.4			19.6			9.8			11.4	
Approach LOS		С			В			А			В	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		44.3		21.8		44.3		21.8				
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0				
Max Green Setting (Gmax), s		58.0		20.0		58.0		20.0				
Max Q Clear Time (g_c+l1), s		23.1		3.0		29.2		8.7				
Green Ext Time (p_c), s		9.7		1.2		9.2		0.9				
Intersection Summary												
HCM 2010 Ctrl Delay			12.6									
HCM 2010 LOS			В									

	۶	<b>→</b>	<b>*</b>	<b>*</b>	<b>←</b>	*	•	†	~	<b>/</b>	<b>↓</b>	4
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4		7	f)		7	f)		7	ĵ.	
Volume (veh/h)	62	25	89	10	39	12	123	570	4	19	267	75
Number	3	8	18	7	4	14	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1810	1900	1810	1810	1900	1792	1792	1900	1776	1776	1900
Adj Flow Rate, veh/h	69	28	99	11	43	13	137	633	4	21	297	83
Adj No. of Lanes	0	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	5	5	5	5	5	5	6	6	6	7	7	7
Cap, veh/h	202	99	218	485	379	115	473	889	6	298	667	187
Arrive On Green	0.28	0.28	0.28	0.28	0.28	0.28	0.50	0.50	0.50	0.50	0.50	0.50
Sat Flow, veh/h	402	349	767	1222	1335	404	961	1779	11	751	1336	373
Grp Volume(v), veh/h	196	0	0	11	0	56	137	0	637	21	0	380
Grp Sat Flow(s),veh/h/ln	1518	0	0	1222	0	1738	961	0	1790	751	0	1710
Q Serve(g_s), s	2.0	0.0	0.0	0.0	0.0	1.3	5.9	0.0	15.3	1.2	0.0	7.9
Cycle Q Clear(g_c), s	5.6	0.0	0.0	0.3	0.0	1.3	13.8	0.0	15.3	16.5	0.0	7.9
Prop In Lane	0.35		0.51	1.00		0.23	1.00		0.01	1.00		0.22
Lane Grp Cap(c), veh/h	519	0	0	485	0	493	473	0	894	298	0	854
V/C Ratio(X)	0.38	0.00	0.00	0.02	0.00	0.11	0.29	0.00	0.71	0.07	0.00	0.44
Avail Cap(c_a), veh/h	713	0	0	646	0	722	947	0	1778	668	0	1698
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	16.1	0.0	0.0	14.3	0.0	14.7	13.4	0.0	10.8	17.2	0.0	8.9
Incr Delay (d2), s/veh	0.5	0.0	0.0	0.0	0.0	0.1	0.3	0.0	1.1	0.1	0.0	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	0.0	0.0	0.1	0.0	0.6	1.6	0.0	7.7	0.3	0.0	3.8
LnGrp Delay(d),s/veh	16.6	0.0	0.0	14.3	0.0	14.8	13.7	0.0	11.8	17.3	0.0	9.3
LnGrp LOS	В			В		В	В		В	В		А
Approach Vol, veh/h		196			67			774			401	
Approach Delay, s/veh		16.6			14.7			12.2			9.7	
Approach LOS		В			В			В			A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		33.7		21.7		33.7		21.7				
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0				
Max Green Setting (Gmax), s		55.0		23.0		55.0		23.0				
Max Q Clear Time (g_c+l1), s		18.5		3.3		17.3		7.6				
Green Ext Time (p_c), s		9.1		1.5		9.2		1.3				
Intersection Summary												
HCM 2010 Ctrl Delay			12.2									
HCM 2010 LOS			В									

	<b>*</b>	*	†	<i>&gt;</i>	<b>\</b>	<b>+</b>
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	ች	7	<b></b>	7		<b></b>
Volume (veh/h)	53	0	350	86	0	590
Number	7	14	6	16	5	2
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1743	1743	1743	1743	0	1776
Adj Flow Rate, veh/h	59	0	389	0	0	656
Adj No. of Lanes	1	1	1	1	0	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	9	9	9	9	0.50	7
Cap, veh/h	185	165	965	821	0	983
Arrive On Green	0.11	0.00	0.55	0.00	0.00	0.55
Sat Flow, veh/h	1660	1482	1743	1482	0.00	1776
Grp Volume(v), veh/h	59	0	389	0	0	656
Grp Sat Flow(s),veh/h/ln	1660	1482	1743	1482	0	1776
Q Serve(g_s), s	1.2	0.0	4.6	0.0	0.0	9.4
Cycle Q Clear(g_c), s	1.2	0.0	4.6	0.0	0.0	9.4
Prop In Lane	1.00	1.00		1.00	0.00	
Lane Grp Cap(c), veh/h	185	165	965	821	0	983
V/C Ratio(X)	0.32	0.00	0.40	0.00	0.00	0.67
Avail Cap(c_a), veh/h	509	455	2771	2355	0	2823
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	0.00	1.00
Uniform Delay (d), s/veh	14.7	0.0	4.6	0.0	0.0	5.7
Incr Delay (d2), s/veh	1.0	0.0	0.3	0.0	0.0	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	0.0	2.2	0.0	0.0	4.6
LnGrp Delay(d),s/veh	15.7	0.0	4.9	0.0	0.0	6.4
LnGrp LOS	В	3.0	Α.5	5.0	3.0	Α
Approach Vol, veh/h	59		389			656
	15.7		4.9			6.4
Approach LOS						
Approach LOS	В		Α			А
Timer	1	2	3	4	5	6
Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		25.9		10.0		25.9
Change Period (Y+Rc), s		6.0		6.0		6.0
Max Green Setting (Gmax), s		57.0		11.0		57.0
Max Q Clear Time (g_c+l1), s		11.4		3.2		6.6
Green Ext Time (p_c), s		8.5		0.1		8.6
Intersection Summary						
HCM 2010 Ctrl Delay			6.4			
HCM 2010 LOS			A			
			/ \			

		- 1			*	
WBL	WBR	NBT	NBR	SBL	SBT	
ሻ	7	<b>↑</b>	7		<b>^</b>	
67	0	649	79	0	371	
7	14	6	16	5	2	
0	0	0	0	0	0	
1.00	1.00		1.00	1.00		
1.00	1.00	1.00	1.00	1.00	1.00	
1776	1776	1776	1776	0	1792	
74	0	721	0	0	412	
1	1	1	1	0	1	
0.90	0.90	0.90	0.90	0.90	0.90	
7	7	7	7	0	6	
213	190	1025	871	0	1034	
0.13	0.00	0.58	0.00	0.00	0.58	
1691	1509	1776	1509	0	1792	
				0		
		1025			1034	
		0.0				
	0.0	5.9	0.0	0.0	2.5	
17.1	0.0	7.0	0.0	0.0	4.9	
В						
В		A			A	
1	2	3	4	5	6	7 8
			4			•
	9.8		0.1		9.6	
		6.9				
		n u				
	67 7 0 1.00 1.00 1776 74 1 0.90 7 213 0.13 1691 1.6 1.00 213 0.35 461 1.00 1.	67 0 7 14 0 0 1.00 1.00 1.00 1.00 1776 1776 74 0 1 1 0.90 0.90 7 7 213 190 0.13 0.00 1691 1509 74 0 1691 1509 1.6 0.0 1.6 0.0 1.00 1.00 213 190 0.35 0.00 461 411 1.00 1.00 1.00 1.00 1.00 0.00 16.1 0.0 1.00 0.00 17.1 0.0 18 0.0 17.1 B 1 2 2 29.3 6.0 57.0 7.1	67 0 649 7 14 6 0 0 0 1.00 1.00 1.00 1.00 1.776 1776 1776 74 0 721 1 1 1 0.90 0.90 0.90 7 7 7 213 190 1025 0.13 0.00 0.58 1691 1509 1776 1.6 0.0 11.7 1.6 0.0 11.7 1.6 0.0 11.7 1.00 1.00 213 190 1025 0.35 0.00 0.70 461 411 2508 1.00 1.00 1.00 1.00 0.00 1.00 1.00 0.00 1.00 1.01 0.00 0.00	67 0 649 79 7 14 6 16 0 0 0 0 0 1.00 1.00 1.00 1.00 1.00 1.00	67         0         649         79         0           7         14         6         16         5           0         0         0         0         0           1.00         1.00         1.00         1.00         1.00           1.00         1.00         1.00         1.00         1.00           1.00         1.00         1.00         1.00         1.00           1.00         1.00         1.00         1.00         1.00           1.76         1776         1776         0         0           1         1         1         1         0         0           0.90         0.90         0.90         0.90         0.90         0.90         0           1         1         1         1         0	67

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		414			4		7	f)		7	ĵ.	
Volume (veh/h)	30	4	82	4	4	4	51	409	4	4	547	58
Number	3	8	18	7	4	14	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1810	1900	1900	1863	1900	1743	1743	1900	1743	1743	1900
Adj Flow Rate, veh/h	33	4	91	4	4	4	57	454	4	4	608	64
Adj No. of Lanes	0	2	0	0	1	0	1	1	0	1	1	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	5	5	5	2	2	2	9	9	9	9	9	9
Cap, veh/h	417	44	343	175	169	131	309	950	8	462	854	90
Arrive On Green	0.24	0.24	0.24	0.24	0.24	0.24	0.55	0.55	0.55	0.55	0.55	0.55
Sat Flow, veh/h	1228	179	1400	380	688	534	714	1725	15	870	1551	163
Grp Volume(v), veh/h	37	0	91	12	0	0	57	0	458	4	0	672
Grp Sat Flow(s),veh/h/ln	1407	0	1400	1602	0	0	714	0	1740	870	0	1714
Q Serve(g_s), s	0.8	0.0	3.1	0.0	0.0	0.0	3.8	0.0	9.4	0.2	0.0	17.0
Cycle Q Clear(g_c), s	1.1	0.0	3.1	0.3	0.0	0.0	20.8	0.0	9.4	9.6	0.0	17.0
Prop In Lane	0.89		1.00	0.33		0.33	1.00		0.01	1.00		0.10
Lane Grp Cap(c), veh/h	461	0	343	474	0	0	309	0	958	462	0	944
V/C Ratio(X)	0.08	0.00	0.27	0.03	0.00	0.00	0.18	0.00	0.48	0.01	0.00	0.71
Avail Cap(c_a), veh/h	547	0	429	570	0	0	646	0	1779	873	0	1753
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	17.1	0.0	17.9	16.9	0.0	0.0	17.4	0.0	8.0	11.0	0.0	9.7
Incr Delay (d2), s/veh	0.1	0.0	0.4	0.0	0.0	0.0	0.3	0.0	0.4	0.0	0.0	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	1.2	0.1	0.0	0.0	0.8	0.0	4.6	0.0	0.0	8.1
LnGrp Delay(d),s/veh	17.2	0.0	18.3	16.9	0.0	0.0	17.7	0.0	8.4	11.0	0.0	10.8
LnGrp LOS	В		В	В			В		Α	В		В
Approach Vol, veh/h		128			12			515			676	
Approach Delay, s/veh		18.0			16.9			9.4			10.8	
Approach LOS		В			В			Α			В	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		38.3		20.4		38.3		20.4				
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0				
Max Green Setting (Gmax), s		60.0		18.0		60.0		18.0				
Max Q Clear Time (g_c+l1), s		19.0		2.3		22.8		5.1				
Green Ext Time (p_c), s		9.7		0.6		9.6		0.6				
Intersection Summary												
HCM 2010 Ctrl Delay			11.0									
HCM 2010 LOS			В									

	۶	<b>→</b>	7	<b>√</b>	<b>←</b>	•	1	<b>†</b>	<i>&gt;</i>	<b>/</b>	<b></b>	4
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		414			4		7	4î		7	f)	
Volume (veh/h)	28	4	50	4	4	4	74	615	4	4	456	29
Number	3	8	18	7	4	14	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1810	1900	1900	1863	1900	1776	1776	1900	1776	1776	1900
Adj Flow Rate, veh/h	31	4	56	4	4	4	82	683	4	4	507	32
Adj No. of Lanes	0	2	0	0	1	0	1	1	0	1	1	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	5	5	5	2	2	2	7	7	7	7	7	7
Cap, veh/h	413	46	329	177	168	127	412	952	6	314	893	56
Arrive On Green	0.23	0.23	0.23	0.23	0.23	0.23	0.54	0.54	0.54	0.54	0.54	0.54
Sat Flow, veh/h	1216	194	1400	368	713	541	822	1764	10	717	1653	104
Grp Volume(v), veh/h	35	0	56	12	0	0	82	0	687	4	0	539
Grp Sat Flow(s),veh/h/ln	1410	0	1400	1623	0	0	822	0	1774	717	0	1757
Q Serve(g_s), s	0.7	0.0	1.7	0.0	0.0	0.0	3.9	0.0	15.5	0.2	0.0	10.8
Cycle Q Clear(g_c), s	1.0	0.0	1.7	0.3	0.0	0.0	14.8	0.0	15.5	15.7	0.0	10.8
Prop In Lane	0.89		1.00	0.33		0.33	1.00		0.01	1.00		0.06
Lane Grp Cap(c), veh/h	458	0	329	471	0	0	412	0	958	314	0	949
V/C Ratio(X)	0.08	0.00	0.17	0.03	0.00	0.00	0.20	0.00	0.72	0.01	0.00	0.57
Avail Cap(c_a), veh/h	603	0	473	632	0	0	893	0	1996	734	0	1978
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	16.0	0.0	16.3	15.7	0.0	0.0	13.0	0.0	9.2	15.1	0.0	8.1
Incr Delay (d2), s/veh	0.1	0.0	0.2	0.0	0.0	0.0	0.2	0.0	1.0	0.0	0.0	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	0.7	0.1	0.0	0.0	0.9	0.0	7.7	0.0	0.0	5.4
LnGrp Delay(d),s/veh	16.0	0.0	16.5	15.7	0.0	0.0	13.3	0.0	10.2	15.1	0.0	8.7
LnGrp LOS	В		В	В			В		В	В		Α
Approach Vol, veh/h		91			12			769			543	
Approach Delay, s/veh		16.3			15.7			10.5			8.7	
Approach LOS		В			В			В			Α	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		34.8		18.5		34.8		18.5				
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0				
Max Green Setting (Gmax), s		60.0		18.0		60.0		18.0				
Max Q Clear Time (g_c+l1), s		17.7		2.3		17.5		3.7				
Green Ext Time (p_c), s		11.1		0.4		11.1		0.4				
Intersection Summary												
HCM 2010 Ctrl Delay			10.3									
HCM 2010 LOS			В									

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	7	ħβ		7	ħβ		7	4î		ሻ	f)	
Volume (veh/h)	15	7	4	4	4	89	4	402	4	152	369	15
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1667	1667	1900	1696	1696	1900	1743	1743	1900	1743	1743	1900
Adj Flow Rate, veh/h	17	8	4	4	4	99	4	447	4	169	410	17
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	14	14	14	12	12	12	9	9	9	9	9	9
Cap, veh/h	376	552	255	466	422	378	450	880	8	433	848	35
Arrive On Green	0.26	0.26	0.26	0.26	0.26	0.26	0.51	0.51	0.51	0.51	0.51	0.51
Sat Flow, veh/h	1151	2105	973	1272	1612	1442	895	1725	15	876	1662	69
Grp Volume(v), veh/h	17	6	6	4	4	99	4	0	451	169	0	427
Grp Sat Flow(s), veh/h/ln	1151	1583	1495	1272	1612	1442	895	0	1740	876	0	1731
Q Serve(g_s), s	0.6	0.1	0.2	0.1	0.1	2.9	0.2	0.0	9.0	8.3	0.0	8.5
Cycle Q Clear(g_c), s	3.5	0.1	0.2	0.3	0.1	2.9	8.6	0.0	9.0	17.4	0.0	8.5
Prop In Lane	1.00		0.65	1.00		1.00	1.00		0.01	1.00		0.04
Lane Grp Cap(c), veh/h	376	415	392	466	422	378	450	0	888	433	0	883
V/C Ratio(X)	0.05	0.01	0.02	0.01	0.01	0.26	0.01	0.00	0.51	0.39	0.00	0.48
Avail Cap(c_a), veh/h	489	571	539	591	581	520	995	0	1948	967	0	1938
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	16.8	14.4	14.4	14.5	14.4	15.4	11.2	0.0	8.5	14.3	0.0	8.4
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.5	0.6	0.0	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.1	0.1	0.0	0.0	1.2	0.0	0.0	4.4	2.1	0.0	4.1
LnGrp Delay(d),s/veh	16.8	14.4	14.4	14.5	14.4	15.8	11.2	0.0	9.0	14.8	0.0	8.8
LnGrp LOS	В	В	В	В	В	В	В		Α	В		Α
Approach Vol, veh/h		29			107			455			596	
Approach Delay, s/veh		15.8			15.7			9.0			10.5	
Approach LOS		В			В			Α			В	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		32.9		19.8		32.9		19.8				
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0				
Max Green Setting (Gmax), s		59.0		19.0		59.0		19.0				
Max Q Clear Time (g_c+l1), s		11.0		5.5		19.4		4.9				
Green Ext Time (p_c), s		7.7		0.5		7.5		0.5				
Intersection Summary												
HCM 2010 Ctrl Delay			10.5									
HCM 2010 LOS			В									

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	7	<b>∱</b> ∱		ሻ	<b>ተ</b> ኈ		7	<b>₽</b>		ሻ	₽	
Volume (veh/h)	23	9	4	4	4	164	4	491	4	81	417	10
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1712	1712	1900	1727	1727	1900	1792	1792	1900	1776	1776	1900
Adj Flow Rate, veh/h	26	10	4	4	4	182	4	546	4	90	463	11
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	11	11	11	10	10	10	6	6	6	7	7	7
Cap, veh/h	328	652	245	491	462	414	411	889	7	358	865	21
Arrive On Green	0.28	0.28	0.28	0.28	0.28	0.28	0.50	0.50	0.50	0.50	0.50	0.50
Sat Flow, veh/h	1096	2315	869	1293	1641	1468	882	1777	13	814	1727	41
Grp Volume(v), veh/h	26	7	7	4	4	182	4	0	550	90	0	474
Grp Sat Flow(s),veh/h/ln	1096	1626	1558	1293	1641	1468	882	0	1790	814	0	1768
Q Serve(g_s), s	1.1	0.2	0.2	0.1	0.1	5.6	0.2	0.0	12.2	4.9	0.0	10.1
Cycle Q Clear(g_c), s	6.7	0.2	0.2	0.3	0.1	5.6	10.3	0.0	12.2	17.1	0.0	10.1
Prop In Lane	1.00		0.56	1.00		1.00	1.00		0.01	1.00		0.02
Lane Grp Cap(c), veh/h	328	458	439	491	462	414	411	0	896	358	0	885
V/C Ratio(X)	0.08	0.01	0.02	0.01	0.01	0.44	0.01	0.00	0.61	0.25	0.00	0.54
Avail Cap(c_a), veh/h	397	561	537	572	566	506	913	0	1917	822	0	1893
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	19.0	14.3	14.3	14.4	14.2	16.2	12.9	0.0	9.9	16.1	0.0	9.4
Incr Delay (d2), s/veh	0.1	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.7	0.4	0.0	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.1	0.1	0.0	0.0	2.4	0.0	0.0	6.1	1.1	0.0	5.0
LnGrp Delay(d),s/veh	19.1	14.3	14.3	14.4	14.3	17.0	12.9	0.0	10.6	16.5	0.0	9.9
LnGrp LOS	В	В	В	В	В	В	В		В	В		Α
Approach Vol, veh/h		40			190			554			564	
Approach Delay, s/veh		17.4			16.9			10.6			10.9	
Approach LOS		В			В			В			В	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		33.6		21.5		33.6		21.5				
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0				
Max Green Setting (Gmax), s		59.0		19.0		59.0		19.0				
Max Q Clear Time (g_c+l1), s		14.2		8.7		19.1		7.6				
Green Ext Time (p_c), s		8.6		0.9		8.4		0.9				
Intersection Summary												
HCM 2010 Ctrl Delay			11.8									
HCM 2010 LOS			В									

Intersection									
nt Delay, s/veh	0.8								
Marray 1	MDI	WDD		N.	IDT	NDD	ODI	ODT	
Movement	WBL	WBR				NBR	SBL	SBT	
Vol, veh/h	8	7		ĺ	171	16	17	121	
Conflicting Peds, #/hr	0	0		_	0	0	0	0	
Sign Control	Stop	Stop		F		Free	Free	Free	
RT Channelized	-	None			- 1	Vone	-	None	
Storage Length	0	-			-	-	-	-	
Veh in Median Storage, #	0	-			0	-	-	0	
Grade, %	0	-			0	-	-	0	
Peak Hour Factor	90	90			90	90	90	90	
Heavy Vehicles, %	2	2			2	2	2	2	
Mvmt Flow	9	8		,	190	18	19	134	
Major/Minor	Minor1			Maj	or1		Major2		
Conflicting Flow All	371	199			0	0	208	0	
Stage 1	199	-			-	-	-	-	
Stage 2	172	-			-	-	-	-	
Critical Hdwy	6.42	6.22			-	-	4.12	-	
Critical Hdwy Stg 1	5.42	-			-	-	-	-	
Critical Hdwy Stg 2	5.42	-			-	-	-	-	
Follow-up Hdwy	3.518	3.318			-	-	2.218	-	
Pot Cap-1 Maneuver	630	842			-	-	1363	-	
Stage 1	835	-			-	-	-	-	
Stage 2	858	-			-	-	-	-	
Platoon blocked, %					-	-		-	
Mov Cap-1 Maneuver	621	842			-	-	1363	-	
Mov Cap-2 Maneuver	621	-			-	-	-	-	
Stage 1	835	-			-	-	-	-	
Stage 2	845	-			-	-	-	-	
Approach	WB				NB		SB		
HCM Control Delay, s	10.2						0.9		
HCM LOS	В								
Minor Lane/Major Mvmt	NBT	NBR WBLn1	SBL	SBT					
Capacity (veh/h)	-	- 708	1363	-					
HCM Lane V/C Ratio	_	- 0.024	0.014	-					
HCM Control Delay (s)	-	- 10.2	7.7	0					
HCM Lane LOS	_	- B	Α	A					
HCM 95th %tile Q(veh)	-	- 0	0	-					

Intersection									
Int Delay, s/veh	1.1								
					VD.T	NDE		225	
Movement	WBL	WBR			NBT	NBR	SBL		
Vol, veh/h	15	18			116	7	8		
Conflicting Peds, #/hr	0	0			0	0	0		
Sign Control	Stop	Stop		F	ree	Free	Free		
RT Channelized	-	None			-	None	-	None	
Storage Length	0	-			-	-	-		
Veh in Median Storage, #	0	-			0	-	-	v	
Grade, %	0	-			0	-	-	v	
Peak Hour Factor	90	90			90	90	90		
Heavy Vehicles, %	2	2			2	2	2		
Mvmt Flow	17	20			129	8	9	206	
Major/Minor	Minor1			Ma	ijor1		Major2		
Conflicting Flow All	356	133			0	0	137		
Stage 1	133	-			-	-	-	-	
Stage 2	223	_			-	-	_	-	
Critical Hdwy	6.42	6.22			-	-	4.12	-	
Critical Hdwy Stg 1	5.42	-			-	-	-		
Critical Hdwy Stg 2	5.42	-			-	-	-	_	
Follow-up Hdwy	3.518	3.318			-	-	2.218	-	
Pot Cap-1 Maneuver	642	916			-	-	1447		
Stage 1	893	-			-	-	-		
Stage 2	814	-			-	-	-	_	
Platoon blocked, %					-	-		-	
Mov Cap-1 Maneuver	638	916			-	-	1447	-	
Mov Cap-2 Maneuver	638	-			-	-	-		
Stage 1	893	-			-	-	-	-	
Stage 2	808	-			-	-	-	_	
Approach	WB				NB		SB		
HCM Control Delay, s	9.9						0.3		
HCM LOS	3.5 A						0.0		
TIOM LOO	A								
Minor Lane/Major Mvmt	NBT	NBR WBLn1	SBL	SBT					
Capacity (veh/h)	-	- 765	1447	-					
HCM Lane V/C Ratio	<u>-</u>	- 0.048	0.006	-					
HCM Control Delay (s)	<u>-</u>	- 9.9	7.5	0					
HCM Lane LOS	-	- 9.9	7.5 A	A					
HCM 95th %tile Q(veh)		- A	0	- -					

Intersection											
Int Delay, s/veh	4.1										
iiit Delay, S/VeII	4.1										
Movement	EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR
Vol, veh/h	30	4	160		4	4	5		87	43	6
Conflicting Peds, #/hr	0	0	0		0	0	0		0	0	0
Sign Control	Stop	Stop	Stop		Stop	Stop	Stop		Free	Free	Free
RT Channelized	-	-	None		-	-	None		-	-	None
Storage Length	-	-	0		-	-	-		-	-	-
Veh in Median Storage, #	-	0	-		-	0	-		-	0	-
Grade, %	-	0	-		-	0	-		-	0	-
Peak Hour Factor	90	90	90		90	90	90		90	90	90
Heavy Vehicles, %	2	2	2		2	2	2		2	2	2
Mvmt Flow	33	4	178		4	4	6		97	48	7
Major/Minor	Minor2				Minor1			Ma	ajor1		
Conflicting Flow All	412	441	97		343	446	27		193	0	0
Stage 1	193	193	-		244	244	-		-	-	_
Stage 2	219	248	-		99	202	-		-	-	-
Critical Hdwy	7.54	6.54	6.94		7.54	6.54	6.94		4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-		6.54	5.54	-		-	-	-
Critical Hdwy Stg 2	6.54	5.54	-		6.54	5.54	-		-	-	-
Follow-up Hdwy	3.52	4.02	3.32		3.52	4.02	3.32		2.22	-	-
Pot Cap-1 Maneuver	524	509	940		587	506	1042	•	1378	-	-
Stage 1	790	740	-		738	703	-		-	-	-
Stage 2	763	700	-		896	733	-		-	-	-
Platoon blocked, %										-	-
Mov Cap-1 Maneuver	487	470	940		445	468	1042	•	1378	-	-
Mov Cap-2 Maneuver	487	470	-		445	468	-		-	-	-
Stage 1	732	738	-		684	652	-		-	-	-
Stage 2	699	649	-		720	731	-		-	-	-
Approach	EB				WB				NB		
HCM Control Delay, s	10.3				11.3						
HCM LOS	В				В						
Minor Long/Major Mumt	MDI	NDT	NDD	EDI n4	EDI 50	WBLn1	CDI	CDT	CDD		
Minor Lane/Major Mvmt	NBL 1270	NBT	NBR	EBLn1	EBLn2		SBL		SBR		
Capacity (veh/h)	1378	-	-	485	940	582	1535	-	-		
HCM Cantrol Polov (a)	0.07	0.4	-	0.078	0.189	0.025	0.003	-	-		
HCM Long LOS	7.8	0.1	-	13	9.7	11.3	7.4	0	-		
HCM Lane LOS	A	Α	-	В	A	В	A	Α	-		
HCM 95th %tile Q(veh)	0	-	-	0	1	0	0	-	-		

Intersection			
Int Delay, s/veh			
Movement	SBL	SBT	SBR
Vol, veh/h	4	158	16
Conflicting Peds, #/hr	0	0	_ 0
Sign Control	Free	Free	Free
RT Channelized	-	-	None
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	90	90	90
Heavy Vehicles, %	4	4	4
Mvmt Flow	4	176	18
NA - : /NA:	M-:0		
Major/Minor	Major2		
Conflicting Flow All	54	0	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.18	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.24	-	-
Pot Cap-1 Maneuver	1535	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	1535	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	_
0.030 =			
	65		
Approach	SB		
HCM Control Delay, s			
HCM LOS			
Minor Lane/Major Mvmt			
willor Larie/iviajor ivivitit			

Intersection											
Int Delay, s/veh	2.5										
mt Boldy, 5/Von	2.0										
Movement	EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR
Vol, veh/h	14	4	92		5	4	5		154	138	5
Conflicting Peds, #/hr	0	0	0		0	0	0		0	0	0
Sign Control	Stop	Stop	Stop		Stop	Stop	Stop		Free	Free	Free
RT Channelized	-	-	None		-	-	None		-	-	None
Storage Length	-	-	0		-	-	-		-	-	-
Veh in Median Storage, #	-	0	-		-	0	-		-	0	-
Grade, %	-	0	-		-	0	-		-	0	-
Peak Hour Factor	90	90	90		90	90	90		90	90	90
Heavy Vehicles, %	2	2	2		2	2	2		2	2	2
Mvmt Flow	16	4	102		6	4	6		171	153	6
Major/Minor	Minor2				Minor1			Λ	/lajor1		
Conflicting Flow All	512	592	52		540	612	79		103	0	0
Stage 1	91	91	-		498	498	-		-	-	-
Stage 2	421	501	-		42	114	-		-	-	-
Critical Hdwy	7.54	6.54	6.94		7.54	6.54	6.94		4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-		6.54	5.54	-		-	-	-
Critical Hdwy Stg 2	6.54	5.54	-		6.54	5.54	-		-	-	-
Follow-up Hdwy	3.52	4.02	3.32		3.52	4.02	3.32		2.22	-	-
Pot Cap-1 Maneuver	445	418	1005		425	407	965		1487	-	-
Stage 1	906	819	-		523	543	-		-	-	-
Stage 2	581	541	-		967	800	-		-	-	-
Platoon blocked, %										-	
Mov Cap-1 Maneuver	394	364	1005		340	354	965		1487	-	-
Mov Cap-2 Maneuver	394	364	-		340	354	-		-	-	-
Stage 1	792	815	-		457	475	-		-	-	-
Stage 2	500	473	-		860	796	-		-	-	-
Approach	EB				WB				NB		
HCM Control Delay, s	9.9				13.3				ND		
HCM LOS	A.				В						
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR		
Capacity (veh/h)	1487	-	-	387	1005	449	1403	-	-		
HCM Lane V/C Ratio	0.115	-	-	0.052	0.102	0.035	0.004	-	-		
HCM Control Delay (s)	7.7	0.2	-	14.8	9	13.3	7.6	0	-		
HCM Lane LOS	А	Α	-	В	Α	В	Α	Α	-		
HCM 95th %tile Q(veh)	0	-	-	0	0	0	0	-	-		

Intersection			
Int Delay, s/veh			
Movement	SBL	SBT	SBR
Vol, veh/h	5	51	42
Conflicting Peds, #/hr	0	0	0
Sign Control	Free	Free	Free
RT Channelized	-	-	None
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	90	90	90
Heavy Vehicles, %	4	4	4
Mvmt Flow	6	57	47
Maior/Minor	Maiaro		
Major/Minor	Major2		
Conflicting Flow All	159	0	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.18	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.24	-	-
Pot Cap-1 Maneuver	1403	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	1403	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Approach	SB		
HCM Control Delay, s			
HCM LOS			
Minor Lane/Major Mvmt			

Intersection										
Intersection Delay, s/veh	11.2									
Intersection LOS	В									
Movement	WBU	WBL	WBR	NBU	NBT	NBR	SBU	SBL	SBT	
Vol, veh/h	0	13	62	0	105	15	0	143	196	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	
Heavy Vehicles, %	2	2	2	2	2	2	2	4	4	
Mvmt Flow	0	14	69	0	117	17	0	159	218	
Number of Lanes	0	1	1	0	1	1	0	0	1	

Approach	WB	NB	SB	
Opposing Approach		SB	NB	_
Opposing Lanes	0	1	2	
Conflicting Approach Left	NB		WB	
Conflicting Lanes Left	2	0	2	
Conflicting Approach Right	SB	WB		
Conflicting Lanes Right	1	2	0	
HCM Control Delay	8.5	8.6	12.7	
HCM LOS	Α	Α	В	

Lane	NBLn1	NBLn2	WBLn1	WBLn2	SBLn1	
Vol Left, %	0%	0%	100%	0%	42%	
Vol Thru, %	100%	0%	0%	0%	58%	
Vol Right, %	0%	100%	0%	100%	0%	
Sign Control	Stop	Stop	Stop	Stop	Stop	
Traffic Vol by Lane	105	15	13	62	339	
LT Vol	105	0	0	0	196	
Through Vol	0	15	0	62	0	
RT Vol	0	0	13	0	143	
Lane Flow Rate	117	17	14	69	377	
Geometry Grp	7	7	7	7	4	
Degree of Util (X)	0.164	0.02	0.025	0.097	0.505	
Departure Headway (Hd)	5.06	4.355	6.273	5.063	4.825	
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	
Cap	709	822	571	707	750	
Service Time	2.787	2.082	4.009	2.799	2.847	
HCM Lane V/C Ratio	0.165	0.021	0.025	0.098	0.503	
HCM Control Delay	8.8	7.2	9.2	8.3	12.7	
HCM Lane LOS	Α	Α	Α	Α	В	
HCM 95th-tile Q	0.6	0.1	0.1	0.3	2.9	

Intersection										
Intersection Delay, s/veh	9.7									
Intersection LOS	А									
Movement	WBU	WBL	WBR	NBU	NBT	NBR	SBU	SBL	SBT	
Vol, veh/h	0	14	155	0	180	12	0	56	114	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	
Heavy Vehicles, %	2	2	2	2	2	2	2	4	4	
Mvmt Flow	0	16	172	0	200	13	0	62	127	
Number of Lanes	0	1	1	0	1	1	0	0	1	

Approach	WB	NB	SB	
Opposing Approach		SB	NB	
Opposing Lanes	0	1	2	
Conflicting Approach Left	NB		WB	
Conflicting Lanes Left	2	0	2	
Conflicting Approach Right	SB	WB		
Conflicting Lanes Right	1	2	0	
HCM Control Delay	9.1	9.8	10.1	
HCM LOS	А	А	В	

Lane	NBLn1	NBLn2	WBLn1	WBLn2	SBLn1	
Vol Left, %	0%	0%	100%	0%	33%	
Vol Thru, %	100%	0%	0%	0%	67%	
Vol Right, %	0%	100%	0%	100%	0%	
Sign Control	Stop	Stop	Stop	Stop	Stop	
Traffic Vol by Lane	180	12	14	155	170	
LT Vol	180	0	0	0	114	
Through Vol	0	12	0	155	0	
RT Vol	0	0	14	0	56	
Lane Flow Rate	200	13	16	172	189	
Geometry Grp	7	7	7	7	4	
Degree of Util (X)	0.288	0.017	0.026	0.232	0.271	
Departure Headway (Hd)	5.182	4.477	6.051	4.843	5.164	
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	
Сар	692	796	591	739	693	
Service Time	2.928	2.224	3.795	2.586	3.213	
HCM Lane V/C Ratio	0.289	0.016	0.027	0.233	0.273	
HCM Control Delay	10	7.3	9	9.1	10.1	
HCM Lane LOS	Α	Α	Α	Α	В	
HCM 95th-tile Q	1.2	0.1	0.1	0.9	1.1	

Intersection	1.1							
nt Delay, s/veh	1.4							
Movement	WBL	WBR			NBT	NBR	SBL	SBT
Vol, veh/h	8	26			158	8	67	357
Conflicting Peds, #/hr	0	0			0	0	0	0
Sign Control	Stop	Stop			Free	Free	Free	Free
RT Channelized	· -	None			-	None	-	None
Storage Length	0	-			-	-	-	-
Veh in Median Storage, #	0	-			0	-	-	0
Grade, %	0	-			0	-	-	0
Peak Hour Factor	90	90			90	90	90	90
Heavy Vehicles, %	14	14			4	4	6	6
Mvmt Flow	9	29			176	9	74	397
Major/Minor	Minor1				Major1		Major2	
Conflicting Flow All	726	180			0	0	184	0
Stage 1	180	-			-	-	-	-
Stage 2	546	-			-	-	-	-
Critical Hdwy	6.54	6.34			-	-	4.16	-
Critical Hdwy Stg 1	5.54	-			-	-	-	-
Critical Hdwy Stg 2	5.54	-			-	-	-	-
Follow-up Hdwy	3.626	3.426			-	-	2.254	-
Pot Cap-1 Maneuver	374	833			-	-	1367	-
Stage 1	823	-			-	-	-	-
Stage 2	557	-			-	-	-	-
Platoon blocked, %					-	-		-
Mov Cap-1 Maneuver	348	833			-	-	1367	-
Mov Cap-2 Maneuver	348	-			-	-	-	-
Stage 1	823	-			-	-	-	-
Stage 2	519	-			-	-	-	-
Approach	WB				NB		SB	
HCM Control Delay, s	11.1						1.2	
HCM LOS	В							
Minor Lane/Major Mvmt	NBT	NBR WBLn1	SBL	SBT				
Capacity (veh/h)	-	- 627	1367	-				
HCM Lane V/C Ratio	-	- 0.06	0.054	-				
HCM Control Delay (s)	-	- 11.1	7.8	0				
HCM Lane LOS	-	- B	Α	Α				
HCM 95th %tile Q(veh)	-	- 0	0	-				

Intersection							
nt Delay, s/veh	1.9						
Movement	WBL	WBR		NBT	NBR	SBL	SBT
Vol, veh/h	8	77		372	8	27	164
Conflicting Peds, #/hr	0	0		0	0	0	0
Sign Control	Stop	Stop		Free	Free	Free	Free
RT Channelized	-	None		-	None	-	None
Storage Length	0	-		-	-	-	-
Veh in Median Storage, #	0	-		0	-	-	0
Grade, %	0	-		0	-	-	0
Peak Hour Factor	90	90		90	90	90	90
Heavy Vehicles, %	10	10		4	4	5	5
Mvmt Flow	9	86		413	9	30	182
Major/Minor	Minor1			Major1		Major2	
Conflicting Flow All	660	418		0		422	0
Stage 1	418	-		-		-	-
Stage 2	242	-		_	_	-	-
Critical Hdwy	6.5	6.3		-		4.15	-
Critical Hdwy Stg 1	5.5	-		-	-	-	-
Critical Hdwy Stg 2	5.5	-		-		-	-
Follow-up Hdwy	3.59	3.39		-	_	2.245	-
Pot Cap-1 Maneuver	416	618		-	_	1121	-
Stage 1	647	-		-	_	-	-
Stage 2	780	-		-	_	-	-
Platoon blocked, %				-	-		-
Mov Cap-1 Maneuver	404	618		-	_	1121	-
Mov Cap-2 Maneuver	404	-		-	-	-	-
Stage 1	647	-		-	-	-	-
Stage 2	757	-		-	-	-	-
Approach	WB			NB		SB	
HCM Control Delay, s	12.3					1.2	
HCM LOS	В						
Minor Lane/Major Mvmt	NBT	NBR WBLn1	SBL	SBT			
Capacity (veh/h)	-	- 589	1121	-			
HCM Lane V/C Ratio	-	- 0.16	0.027	-			
HCM Control Delay (s)	-	- 12.3	8.3	0			
HCM Lane LOS	-	- B	A	A			
HCM 95th %tile Q(veh)	-	- 1	0	-			

Intersection								
Int Delay, s/veh	1.7							
Movement	WBL	WBR			NDT	NDD	SBL	SBT
Movement Vol, veh/h	35	155			NBT 144	NBR 94	345	113
Conflicting Peds, #/hr	0	0			0	0	0	0
Sign Control	Stop	Stop			Free	Free	Free	Free
RT Channelized	<b>Οι</b> υρ	Free			-	None	-	None
Storage Length	0	100				-	0	-
Veh in Median Storage, #	0	100			0	_	-	0
Grade, %	0				0			0
Peak Hour Factor	90	90			90	90	90	90
Heavy Vehicles, %	6	6			10	10	11	11
Mvmt Flow	39	172			160	104	383	126
WIVING 1 IOW	J3	112			100	104	303	120
Major/Minor	Minor1				Major1		Major2	
Conflicting Flow All	1104	-			0	0	264	0
Stage 1	212	-			-	-	-	-
Stage 2	892	-			-	-	-	-
Critical Hdwy	6.46	-			-	-	4.21	-
Critical Hdwy Stg 1	5.46	-			-	-	-	-
Critical Hdwy Stg 2	5.46	-			-	-	-	-
Follow-up Hdwy	3.554	-			-	-	2.299	-
Pot Cap-1 Maneuver	229	0			-	-	1250	-
Stage 1	814	0			-	-	-	-
Stage 2	394	0			-	-	-	-
Platoon blocked, %					-	-		-
Mov Cap-1 Maneuver	159	-			-	-	1250	-
Mov Cap-2 Maneuver	159	-			-	-	-	-
Stage 1	814	-			-	-	-	-
Stage 2	273	-			-	-	-	-
A	MD				ND			
Approach	WB				NB		SB	
HCM Control Delay, s	34.8							
HCM LOS	D							
Minor Lane/Major Mvmt	NBT	NBR WBLn1	WBLn2	SBL	SBT			
Capacity (veh/h)	-	- 159	-	1250	-			
HCM Lane V/C Ratio	<u>-</u>	- 0.245	_	0.307	-			
HCM Control Delay (s)	-	- 34.8	0	9.1	-			
HCM Lane LOS	<u>-</u>	- D	A	A	-			
HCM 95th %tile Q(veh)	_	- 1	-	1	_			

Intersection								
nt Delay, s/veh	2							
Movement	WBL	WBR			NBT	NBR	SBL	SBT
Vol, veh/h	68	428			95	77	107	153
Conflicting Peds, #/hr	0	0			0	0	0	0
Sign Control	Stop	Stop			Free	Free	Free	Free
RT Channelized	- -	Free			-	None	-	None
Storage Length	0	100			-	-	0	-
Veh in Median Storage, #	0	-			0	_	-	0
Grade, %	0	-			0	-	-	0
Peak Hour Factor	90	90			90	90	90	90
Heavy Vehicles, %	5	5			9	9	9	9
Mvmt Flow	76	476			106	86	119	170
Major/Minor	Minor1				Major1		Major2	
Conflicting Flow All	556	-			0	0	191	0
Stage 1	148	-			-	-	-	-
Stage 2	408	-			-	-	-	-
Critical Hdwy	6.45	-			-	-	4.19	-
Critical Hdwy Stg 1	5.45	-			-	-	-	-
Critical Hdwy Stg 2	5.45	-			-	-	-	-
Follow-up Hdwy	3.545	-			-	-	2.281	-
Pot Cap-1 Maneuver	487	0			-	-	1342	-
Stage 1	872	0			-	-	-	-
Stage 2	665	0			-	-	-	-
Platoon blocked, %					-	-		-
Mov Cap-1 Maneuver	444	-			-	-	1342	-
Mov Cap-2 Maneuver	444	-			-	-	-	-
Stage 1	872	-			-	-	-	-
Stage 2	606	-			-	-	-	-
	14.05				NE		0.7	
Approach	WB				NB		SB	
HCM Control Delay, s	14.8							
HCM LOS	В							
Minor Lane/Major Mvmt	NBT	NBR WBLn1	WBLn2	SBL	SBT			
Capacity (veh/h)	-	- 444	-	1342	-			
HCM Lane V/C Ratio		- 0.17	_	0.089	_			
HCM Control Delay (s)		- 14.8	0	7.9	_			
HCM Lane LOS		- B	A	7.5 A	_			
HCM 95th %tile Q(veh)	- -	- 1	-	0	_			

Intersection Int Delay, s/veh	4.5					
iiit Delay, S/VeII	4.5					
Movement	EBL	EBR	NBL	. NBT	SBT	SBR
Vol, veh/h	121	80	54	220	368	69
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	150	-	-	-
Veh in Median Storage, #	0	-	-	. 0	0	-
Grade, %	0	-	-	. 0	0	-
Peak Hour Factor	90	90	90		90	90
Heavy Vehicles, %	2	2	11	11	15	15
Mvmt Flow	134	89	60	244	409	77
Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	689	243	486	0	-	0
Stage 1	447	-	-		-	-
Stage 2	242	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.32	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-		-	-
Follow-up Hdwy	3.52	3.32	2.31	-	-	-
Pot Cap-1 Maneuver	380	758	1012		-	-
Stage 1	611	-	-		-	-
Stage 2	776	-	-		-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	357	758	1012	<u>-</u>	-	-
Mov Cap-2 Maneuver	357	-	-		-	-
Stage 1	611	-	-		-	_
Stage 2	730	-		-	-	-
Approach	EB		NB	}	SB	
HCM Control Delay, s	20.5					
HCM LOS	С					
Minor Lane/Major Mvmt	NBL	NBT EBLn1	SBT SBR			
Capacity (veh/h)	1012	- 452				
HCM Lane V/C Ratio	0.059	- 0.494				
HCM Control Delay (s)	8.8	- 20.5				
HCM Lane LOS	А	- C		•		
HCM 95th %tile Q(veh)	0	- 3		-		

Intersection	•							
Int Delay, s/veh	3.6							
Movement	EBL		EBR		NBL	NBT	SBT	SBR
Vol, veh/h	109		47		110	521	207	100
Conflicting Peds, #/hr	0		0		0	0	0	0
Sign Control	Stop		Stop		Free	Free	Free	Free
RT Channelized	·-		None		-	None	-	None
Storage Length	0		-		150	-	-	-
Veh in Median Storage, #	0		-		-	0	0	-
Grade, %	0		-		-	0	0	-
Peak Hour Factor	90		90		90	90	90	90
Heavy Vehicles, %	2		2		9	9	12	12
Mvmt Flow	121		52		122	579	230	111
Major/Minor	Minor2			N	lajor1		Major2	
Conflicting Flow All	820		171		341	0	-	0
Stage 1	286		-		-	-	-	-
Stage 2	534		-		-	-	-	-
Critical Hdwy	6.84		6.94		4.28	-	-	-
Critical Hdwy Stg 1	5.84		-		-	-	-	-
Critical Hdwy Stg 2	5.84		-		-	-	-	-
Follow-up Hdwy	3.52		3.32		2.29	-	-	-
Pot Cap-1 Maneuver	313		843		1166	-	-	-
Stage 1	737		-		-	-	-	-
Stage 2	552		-		-	-	-	-
Platoon blocked, %						-	-	-
Mov Cap-1 Maneuver	280		843		1166	-	-	-
Mov Cap-2 Maneuver	280		-		-	-	-	-
Stage 1	737		-		-	-	-	-
Stage 2	494		-		-	-	-	-
Approach	EB				NB		SB	
	24.9				IND		36	
HCM Control Delay, s HCM LOS	24.9 C							
HOW LOS	C							
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR			
Capacity (veh/h)	1166	-	351	-	-			
HCM Lane V/C Ratio	0.105	-	0.494	-	_			
HCM Control Delay (s)	8.4	-	24.9	-	_			
HCM Lane LOS	A	-	С	-	-			
HCM 95th %tile Q(veh)	0	_	3	_	_			

Int Delay, s/veh								
iiit Delay, S/Veii	16.1							
Movement	EBL		EBR		NBL	NBT	SBT	SBR
Vol, veh/h	398		255		0	367	231	0
Conflicting Peds, #/hr	0		0		0	0	0	0
Sign Control	Stop		Stop		Free	Free	Free	Free
RT Channelized	-		None		-	None	-	None
Storage Length	350		0		_	-	-	-
Veh in Median Storage, #	0		-		_	0	0	_
Grade, %	0		_		_	0	0	_
Peak Hour Factor	90		90		90	90	90	90
Heavy Vehicles, %	11		11		15	15	16	16
Mymt Flow	442		283		0	408	257	0
			200			.00	201	
Major/Minor	Minor2				Major1		Major2	
Conflicting Flow All	461		128		257	0	<del>-</del>	0
Stage 1	257		-		-	-	-	-
Stage 2	204		_		_	_	-	_
Critical Hdwy	7.02		7.12		4.4	-	-	_
Critical Hdwy Stg 1	6.02		-		-	-	-	_
Critical Hdwy Stg 2	6.02		-		-	_	-	_
Follow-up Hdwy	3.61		3.41		2.35	-	-	_
Pot Cap-1 Maneuver	507		870		1215	-	-	-
Stage 1	736		-		-	-	-	_
Stage 2	784		-		-	-	-	-
Platoon blocked, %						-	-	_
Mov Cap-1 Maneuver	507		870		1215	-	-	-
Mov Cap-2 Maneuver	507		-		-	-	-	_
Stage 1	736		-		-	-	-	-
Stage 2	784		-		-	-	-	-
Approach	EB				NB		SB	
HCM Control Delay, s	30.8							
HCM LOS	D							
Minor Lane/Major Mvmt	NBL		EBLn1	EBLn2	SBT	SBR		
Capacity (veh/h)	1215	-	507	870	-	-		
HCM Lane V/C Ratio	-	-	0.872	0.326	-	-		
HCM Control Delay (s)	0	-	43.5	11.1	-	-		
HCM Lane LOS	A	-	Е	В	-	-		
HCM 95th %tile Q(veh)	0	-	9	1	-	-		

Intersection								
Int Delay, s/veh	2.7							
Movement	EBL		EBR		NBL	NBT	SBT	SBR
Vol, veh/h	98		87		0	538	172	0
Conflicting Peds, #/hr	0		0		0	0	0	0
Sign Control	Stop		Stop		Free	Free	Free	Free
RT Channelized	-		None		-	None	-	None
Storage Length	350		0		-	-	-	-
Veh in Median Storage, #	0		-		-	0	0	-
Grade, %	0		-		-	0	0	-
Peak Hour Factor	90		90		90	90	90	90
Heavy Vehicles, %	33		33		12	12	17	17
Mvmt Flow	109		97		0	598	191	0
Major/Minor	Minor2				Major1		Major2	
Conflicting Flow All	490		96		191	0	-	0
Stage 1	191		-		-	-	-	-
Stage 2	299		-		-	-	-	-
Critical Hdwy	7.46		7.56		4.34	-	-	-
Critical Hdwy Stg 1	6.46		-		-	-	-	-
Critical Hdwy Stg 2	6.46		-		-	-	-	-
Follow-up Hdwy	3.83		3.63		2.32	-	-	-
Pot Cap-1 Maneuver	437		851		1310	-	-	-
Stage 1	737		-		-	-	-	-
Stage 2	642		-		-	-	-	-
Platoon blocked, %						-	-	-
Mov Cap-1 Maneuver	437		851		1310	-	-	-
Mov Cap-2 Maneuver	437		-		-	-	-	-
Stage 1	737		-		-	-	-	-
Stage 2	642		-		-	-	-	-
Approach	EB				NB		SB	
HCM Control Delay, s	13.1							
HCM LOS	В							
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR		
Capacity (veh/h)	1310	-	437	851	-	-		
HCM Lane V/C Ratio	-	-	0.249	0.114	-	-		
HCM Control Delay (s)	0	-	16	9.8	-	-		
HCM Lane LOS	Α	-	С	Α	-	-		

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	0	0	78	687	231	62
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	225	-	-	325
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	16	16	25	25
Mvmt Flow	0	0	87	763	257	69
Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	812	128	257	0	-	0
Stage 1	257	-	-	-	-	-
Stage 2	555	-	-	-	-	_
Critical Hdwy	6.84	6.94	4.42	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	_
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.36	-	-	-
Pot Cap-1 Maneuver	317	898	1209	-	-	-
Stage 1	762	-	-	-	-	_
Stage 2	539	-	-	-	-	-
Platoon blocked, %				-	-	_
Mov Cap-1 Maneuver	294	898	1209	-	-	-
Mov Cap-2 Maneuver	294	-	-	-	-	-
Stage 1	762	-	-	-	-	-
Stage 2	500	-	-	-	-	-
Approach	EB		NB		SB	
HCM Control Delay, s	0				-	
HCM LOS	Ä					
Minor Lane/Major Mvmt	NBL	NBT EBLn1	SBT SBR			
Capacity (veh/h)	1209					
HCM Lane V/C Ratio	0.072					
HCM Control Delay (s)	8.2	- 0				
HCM Lane LOS	Α	- A				
HCM 95th %tile Q(veh)	0					

Intersection	0					
Int Delay, s/veh	0					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	0	0	283	353	172	547
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	225	-	-	325
Veh in Median Storage, #	0	-	-	0	0	_
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	17	17	19	19
Mvmt Flow	0	0	314	392	191	608
Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1016	96	191	0	-	0
Stage 1	191	-	-	-	-	-
Stage 2	825	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.44	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.37	-	-	-
Pot Cap-1 Maneuver	234	942	1277	-	-	-
Stage 1	822	-	-	-	-	-
Stage 2	391	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	176	942	1277	-	-	-
Mov Cap-2 Maneuver	176	-	-	-	-	-
Stage 1	822	-	-	-	-	-
Stage 2	295	-	-	-	-	-
Approach	EB		NB		SB	
HCM Control Delay, s	0					
HCM LOS	А					
Minor Lane/Major Mvmt	NBL	NBT EBLn1	SBT SBR			
Capacity (veh/h)	1277					
HCM Lane V/C Ratio	0.246					
HCM Control Delay (s)	8.7	- 0				
HCM Lane LOS	А	- A				
HCM 95th %tile Q(veh)	1					

Anne   Configurations   Type		ၨ	•	•	†	<b>+</b>	1		
Volume (veh/h)	Movement	EBL	EBR	NBL	NBT	SBT	SBR		
Volume (veh/h)	Lane Configurations	ሻሻ				<b>^</b>	7		
Alumber 3 18 1 6 2 12  Initial Q (Qb), veh 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Volume (veh/h)		65	184					
Ped-Bike Adj(A_pbT)	Number	3	18	1	6	2	12		
Parking Bus, Adj	Initial Q (Qb), veh	0	0	0	0	0	0		
Adj   Sat   Flow, veh/h/ln	Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00		
Adj Flow Rate, veh/h	Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj   No. of Lanes	Adj Sat Flow, veh/h/ln	1776	1900	1810	1810	1845	1845		
Deak Hour Factor	Adj Flow Rate, veh/h	531	0	204	437	926	1032		
Percent Heavy Veh, % 7 0 5 5 5 3 3 3 3 2 2 2 3 2 3 4 5 6 8 2 2 3 3 3 3 2 2 3 2 3 3 3 3 3 3 3 3 3	Adj No. of Lanes	2	1	1	2	2			
Cap, veh/h Cap, veh/h Cap, veh/h Carrive On Green Cap, veh/h Cast Flow, veh/h Cap Serve(g_s), s Cap Serve(g_s), s Cap Serve(g_s), s Cap Clear(g_c),	Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90		
Arrive On Green	Percent Heavy Veh, %		0			3			
Sat Flow, veh/h Sat Flow, veh/h Sat Flow, veh/h Sat Flow(s), veh/h Sat Flow(s), veh/h Sat Flow(s), veh/h/l Sat Flow(s), veh/l Sat Flow(s), veh/h/l Sat Flow(	Cap, veh/h	602	287		2535	2584			
Strong   Volume(v), veh/h   531   0   204   437   926   1032	Arrive On Green								
Sarp Sat Flow(s), veh/h/ln	Sat Flow, veh/h	3382	1615	217	3529	3597	1568		
Sarp Sat Flow(s),veh/h/ln	Grp Volume(v), veh/h	531	0	204	437	926	1032		
Cycle Q Clear(g_c), s	Grp Sat Flow(s),veh/h/ln	1691	1615	217	1719	1752	1568		
Trop In Lane         1.00         1.00         1.00         1.00           ane Grp Cap(c), veh/h         602         287         186         2535         2584         1156           V/C Ratio(X)         0.88         0.00         1.10         0.17         0.36         0.89           Avail Cap(c_a), veh/h         717         342         186         2535         2584         1156           GCM Platoon Ratio         1.00         1.00         1.00         0.67         0.67           Upstream Filter(I)         1.00         0.00         1.00         0.10         0.17         0.17           Uniform Delay (d), s/veh         47.3         0.0         36.2         4.7         12.7         25.6           ncr Delay (d2), s/veh         11.0         0.0         94.7         0.1         0.1         2.2           nitial Q Delay(d3),s/veh         0.0         0.0         0.0         0.0         0.0         0.0         0.0           sile BackOfQ(50%),veh/ln         9.3         0.0         10.9         2.2         9.3         31.1           nGrp LOS         E         F         A         B         C         C           spproach Vol, veh/h         58.3	Q Serve(g_s), s	18.1	0.0	67.8	4.5	19.2	70.3		
Cane Grp Cap(c), veh/h   602   287   186   2535   2584   1156	Cycle Q Clear(g_c), s	18.1	0.0	87.0	4.5	19.2	70.3		
//C Ratio(X)	Prop In Lane	1.00	1.00	1.00					
Avail Cap(c_a), veh/h Avail Cap(c_a), veh Avail Cap(c_a), veh/h Avail Cap(c_a), veh Avail Cap(c_a), veh Avail Cap(c_a), veh/h Avail	Lane Grp Cap(c), veh/h		287	186	2535	2584	1156		
## ACM Platoon Ratio	V/C Ratio(X)	0.88	0.00	1.10	0.17	0.36			
## Spirate Process of Company Street Process	Avail Cap(c_a), veh/h	717	342	186	2535	2584			
### Arising Delay (d), s/veh   ### 47.3   ### 0.0   ### 36.2   ### 47.3   ### 0.0   ### 36.2   ### 12.7   ### 25.6   ### 12.7   ### 25.6   ### 12.7   ### 25.6   ### 12.7   ### 25.6   ### 12.7   ### 25.6   ### 12.7   ### 25.6   ### 12.8   ### 27.8   ### 12.8   ### 27.8   ### 12.8   ### 27.8   ### 12.8   ### 27.8   ### 12.8   ### 27.8   ### 12.8   ### 27.8   ### 12.8   ### 27.8   ### 12.8   ### 27.8   ###	HCM Platoon Ratio	1.00	1.00	1.00	1.00	0.67	0.67		
nor Delay (d2), s/veh 11.0 0.0 94.7 0.1 0.1 2.2 nitial Q Delay(d3),s/veh 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Upstream Filter(I)	1.00	0.00		1.00	0.17			
Initial Q Delay(d3),s/veh	Uniform Delay (d), s/veh		0.0						
6ile BackOfQ(50%),veh/In       9.3       0.0       10.9       2.2       9.3       31.1         InGrp Delay(d),s/veh       58.3       0.0       130.9       4.8       12.8       27.8         InGrp LOS       E       F       A       B       C         Approach Vol, veh/h       531       641       1958         Approach Delay, s/veh       58.3       44.9       20.7         Approach LOS       E       D       C         Timer       1       2       3       4       5       6       7       8         Assigned Phs       2       6       8       8       8       27.0       20       27.0	Incr Delay (d2), s/veh								
### Company Co	Initial Q Delay(d3),s/veh								
Comparison   Family	%ile BackOfQ(50%),veh/ln								
Approach Vol, veh/h 531 641 1958 Approach Delay, s/veh 58.3 44.9 20.7 Approach LOS E D C  Timer 1 2 3 4 5 6 7 8 Assigned Phs 2 6 8 Phs Duration (G+Y+Rc), s 93.0 93.0 27.0 Change Period (Y+Rc), s 6.0 6.0 6.0 Max Green Setting (Gmax), s 83.0 83.0 25.0 Max Q Clear Time (g_c+l1), s 72.3 89.0 20.1 Green Ext Time (p_c), s 9.8 0.0 0.9  Intersection Summary HCM 2010 Ctrl Delay 32.0 HCM 2010 LOS C	LnGrp Delay(d),s/veh		0.0						
Approach Delay, s/veh Approach LOS E D C Timer 1 2 3 4 5 6 7 8 Assigned Phs Assigne	LnGrp LOS			F			С		
Comparison of	Approach Vol, veh/h								
Timer         1         2         3         4         5         6         7         8           Assigned Phs         2         6         8           Phs Duration (G+Y+Rc), s         93.0         93.0         27.0           Change Period (Y+Rc), s         6.0         6.0         6.0           Max Green Setting (Gmax), s         83.0         83.0         25.0           Max Q Clear Time (g_c+l1), s         72.3         89.0         20.1           Green Ext Time (p_c), s         9.8         0.0         0.9           Intersection Summary         32.0         32.0         32.0         32.0           HCM 2010 LOS         C         C         33.0	Approach Delay, s/veh				44.9				
Assigned Phs 2 6 8 Phs Duration (G+Y+Rc), s 93.0 93.0 27.0 Change Period (Y+Rc), s 6.0 6.0 6.0 Max Green Setting (Gmax), s 83.0 83.0 25.0 Max Q Clear Time (g_c+l1), s 72.3 89.0 20.1 Green Ext Time (p_c), s 9.8 0.0 0.9  Intersection Summary HCM 2010 Ctrl Delay 32.0 HCM 2010 LOS C	Approach LOS	Ε			D	С			
Assigned Phs 2 6 8 Phs Duration (G+Y+Rc), s 93.0 93.0 27.0 Change Period (Y+Rc), s 6.0 6.0 6.0 Max Green Setting (Gmax), s 83.0 83.0 25.0 Max Q Clear Time (g_c+l1), s 72.3 89.0 20.1 Green Ext Time (p_c), s 9.8 0.0 0.9  Intersection Summary HCM 2010 Ctrl Delay 32.0 HCM 2010 LOS C	Timer	1	2	3	4	5	6	7 8	
Phs Duration (G+Y+Rc), s 93.0 93.0 27.0 Change Period (Y+Rc), s 6.0 6.0 6.0 Max Green Setting (Gmax), s 83.0 83.0 25.0 Max Q Clear Time (g_c+l1), s 72.3 89.0 20.1 Green Ext Time (p_c), s 9.8 0.0 0.9 Intersection Summary 32.0 HCM 2010 LOS C	Assigned Phs						6		
Change Period (Y+Rc), s       6.0       6.0       6.0         Max Green Setting (Gmax), s       83.0       25.0         Max Q Clear Time (g_c+l1), s       72.3       89.0       20.1         Green Ext Time (p_c), s       9.8       0.0       0.9         Intersection Summary       32.0       32.0       32.0       32.0         HCM 2010 LOS       C       C       C       C	Phs Duration (G+Y+Rc), s								
Max Green Setting (Gmax), s       83.0       25.0         Max Q Clear Time (g_c+l1), s       72.3       89.0       20.1         Green Ext Time (p_c), s       9.8       0.0       0.9         Intersection Summary       32.0       32.0       32.0       33.0 <td< td=""><td>Change Period (Y+Rc), s</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>	Change Period (Y+Rc), s								
Max Q Clear Time (g_c+I1), s 72.3 89.0 20.1  Green Ext Time (p_c), s 9.8 0.0 0.9  Intersection Summary  HCM 2010 Ctrl Delay 32.0  HCM 2010 LOS C	Max Green Setting (Gmax), s								
Green Ext Time (p_c), s       9.8       0.0       0.9         Intersection Summary       HCM 2010 Ctrl Delay       32.0         HCM 2010 LOS       C	Max Q Clear Time (g_c+l1), s								
ICM 2010 Ctrl Delay 32.0 ICM 2010 LOS C	Green Ext Time (p_c), s								
ICM 2010 LOS C	Intersection Summary								
ICM 2010 LOS C	HCM 2010 Ctrl Delay			32.0					
	HCM 2010 LOS								
	Notes								
iser approved volume paramento among the rames for turning movement.		ng amon	g the land	es for turr	ning move	ment.			

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Movement	EBL	EBR	NBL	NBT	SBT	SBR		
Lane Configurations	AAA		ሻ	<b>^</b>	<b>^</b>	7		
Volume (veh/h)	584	119	185	583	683	618		
Number	3	18	1	6	2	12		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1827	1900	1827	1827	1845	1845		
Adj Flow Rate, veh/h	772	0	206	648	759	687		
Adj No. of Lanes	2	1	1	2	2	1		
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90		
Percent Heavy Veh, %	4	0	4	4	3	3		
Cap, veh/h	879	408	309	2263	2285	1022		
Arrive On Green	0.25	0.00	0.65	0.65	1.00	1.00		
Sat Flow, veh/h	3480	1615	360	3563	3597	1568		
Grp Volume(v), veh/h	772	0	206	648	759	687		
Grp Sat Flow(s), veh/h/ln	1740	1615	360	1736	1752	1568		
Q Serve(g_s), s	20.7	0.0	45.3	7.8	0.0	0.0		
Cycle Q Clear(g_c), s	20.7	0.0	45.3	7.8	0.0	0.0		
Prop In Lane	1.00	1.00	1.00	7.0	0.0	1.00		
ane Grp Cap(c), veh/h	879	408	309	2263	2285	1022		
//C Ratio(X)	0.88	0.00	0.67	0.29	0.33	0.67		
Avail Cap(c_a), veh/h	1073	498	309	2263	2285	1022		
ICM Platoon Ratio	1.00	1.00	1.00	1.00	2.00	2.00		
Jpstream Filter(I)	1.00	0.00	1.00	1.00	0.42	0.42		
Jniform Delay (d), s/veh	34.9	0.0	13.8	7.2	0.0	0.0		
ncr Delay (d2), s/veh	7.3	0.0	10.9	0.3	0.2	1.5		
nitial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	10.9	0.0	5.3	3.8	0.1	0.4		
_nGrp Delay(d),s/veh	42.2	0.0	24.7	7.6	0.2	1.5		
nGrp LOS	D	0.0	C	A	Α	A		
Approach Vol, veh/h	772			854	1446	71		
Approach Delay, s/veh	42.2			11.7	0.8			
Approach LOS	42.2 D			11.7 B	0.6 A			
• •			•				7 0	
imer	1	2	3	4	5	6	7 8	
Assigned Phs		2				6	8	
Phs Duration (G+Y+Rc), s		69.4				69.4	30.6	
Change Period (Y+Rc), s		6.0				6.0	6.0	
Max Green Setting (Gmax), s		58.0				58.0	30.0	
Max Q Clear Time (g_c+I1), s		2.0				47.3	22.7	
Green Ext Time (p_c), s		29.3				8.9	1.8	
ntersection Summary								
HCM 2010 Ctrl Delay			14.2					
HCM 2010 LOS			В					
Votes								
Jser approved volume balanci	ng amon	g the lane	s for turn	ing move	ment.			

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Movement	EBL	EBR	NBL	NBT	SBT	SBR		
ane Configurations	AAA		ሻ	<b>^</b>	<b>^</b>	7		
Volume (veh/h)	559	307	104	707	1455	615		
Number	3	18	1	6	2	12		
nitial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1696	1900	1845	1845	1827	1827		
Adj Flow Rate, veh/h	621	0	116	786	1617	683		
Adj No. of Lanes	2	1	1	2	2	1		
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90		
Percent Heavy Veh, %	12	0	3	3	4	4		
Cap, veh/h	712	356	236	2515	2038	912		
Arrive On Green	0.22	0.00	0.16	1.00	0.59	0.59		
Sat Flow, veh/h	3231	1615	1757	3597	3563	1553		
Grp Volume(v), veh/h	621	0	116	786	1617	683		
Grp Sat Flow(s),veh/h/ln	1616	1615	1757	1752	1736	1553		
Q Serve(g_s), s	21.4	0.0	2.5	0.0	41.5	37.3		
Cycle Q Clear(g_c), s	21.4	0.0	2.5	0.0	41.5	37.3		
Prop In Lane	1.00	1.00	1.00			1.00		
_ane Grp Cap(c), veh/h	712	356	236	2515	2038	912		
V/C Ratio(X)	0.87	0.00	0.49	0.31	0.79	0.75		
Avail Cap(c_a), veh/h	982	491	236	2515	2038	912		
HCM Platoon Ratio	1.00	1.00	2.00	2.00	1.00	1.00		
Jpstream Filter(I)	1.00	0.00	0.82	0.82	1.00	1.00		
Jniform Delay (d), s/veh	43.4	0.0	20.9	0.0	18.4	17.5		
ncr Delay (d2), s/veh	6.6	0.0	1.3	0.3	3.3	5.6		
nitial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	10.2	0.0	2.1	0.1	20.7	17.4		
_nGrp Delay(d),s/veh	49.9	0.0	22.2	0.3	21.6	23.1		
nGrp LOS	D		С	Α	С	С		
Approach Vol, veh/h	621			902	2300			
Approach Delay, s/veh	49.9			3.1	22.1			
Approach LOS	D			A	C			
imer	1	2	3	4	5	6	7 8	
Assigned Phs	1	2				6	8	
Phs Duration (G+Y+Rc), s	15.0	73.6				88.6	31.4	
Change Period (Y+Rc), s	6.0	6.0				6.0	6.0	
Max Green Setting (Gmax), s	9.0	58.0				73.0	35.0	
Max Q Clear Time (g_c+l1), s	4.5	43.5				2.0	23.4	
Green Ext Time (p_c), s	0.1	13.1				46.7	2.0	
" = '	0.1	10.1				70.1	2.0	
ntersection Summary			00.4					
HCM 2010 Ctrl Delay			22.1					
HCM 2010 LOS			С					
Votes								
				ing move				

	۶	7	1	<u>†</u>	Ţ	4		
Movement	EBL	EBR	NBL	NBT	SBT	SBR		
Lane Configurations	ሻሻ		ሻ	<b>^</b>	<b>^</b>	7		
Volume (veh/h)	760	268	66	1101	1033	523		
Number	3	18	1	6	2	12		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1743	1900	1845	1845	1827	1827		
Adj Flow Rate, veh/h	844	0	73	1223	1148	581		
Adj No. of Lanes	2	1	1	2	2	1		
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90		
Percent Heavy Veh, %	9	0.50	3	3	4	4		
Cap, veh/h	970	472	300	2207	1640	734		
Arrive On Green	0.29	0.00	0.13	0.84	0.47	0.47		
Sat Flow, veh/h	3320	1615	1757	3597	3563	1553		
Grp Volume(v), veh/h	844	0	73	1223	1148	581		
Grp Sat Flow(s), veh/h/ln	1660	1615	1757	1752	1736	1553		
	23.0	0.0	1.7	10.1	24.9	30.1		
Q Serve(g_s), s	23.0	0.0	1.7	10.1	24.9	30.1		
Cycle Q Clear(g_c), s			1.00	10.1	24.9	1.00		
Prop In Lane	1.00	1.00		2207	1640			
Lane Grp Cap(c), veh/h	970	472	300	2207	1640	734		
V/C Ratio(X)	0.87	0.00	0.24	0.55	0.70	0.79		
Avail Cap(c_a), veh/h	1287	626	300	2207	1640	734		
HCM Platoon Ratio	1.00	1.00	1.33	1.33	1.00	1.00		
Upstream Filter(I)	1.00	0.00	0.76	0.76	1.00	1.00		
Uniform Delay (d), s/veh	32.1	0.0	13.1	3.7	19.8	21.2		
Incr Delay (d2), s/veh	5.2	0.0	0.3	0.8	2.5	8.5		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	11.3	0.0	0.8	4.8	12.4	14.5		
LnGrp Delay(d),s/veh	37.3	0.0	13.4	4.5	22.3	29.8		
LnGrp LOS	D		В	A	С	С		
Approach Vol, veh/h	844			1296	1729			
Approach Delay, s/veh	37.3			5.0	24.8			
Approach LOS	D			Α	С			
Timer	1	2	3	4	5	6	7 8	
Assigned Phs	1	2				6	8	
Phs Duration (G+Y+Rc), s	15.0	51.1				66.1	33.9	
Change Period (Y+Rc), s	6.0	6.0				6.0	6.0	
Max Green Setting (Gmax), s	9.0	36.0				51.0	37.0	
Max Q Clear Time (g_c+l1), s	3.7	32.1				12.1	25.0	
Green Ext Time (p_c), s	0.1	3.7				28.9	2.9	
Intersection Summary								
HCM 2010 Ctrl Delay			20.9					
HCM 2010 Clif Delay			20.9 C					
Notes								
User approved volume balanci	ng amon	g the lane	es for turn	ing move	ment.			

	<b>≯</b>	<b>→</b>	7	<b>√</b>	<b>←</b>	*	1	†	~	<b>\</b>	Ţ	4
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	7	<b>↑</b> ↑		ሻ	<b>^</b>	7		ર્ન	7	*	f)	
Volume (veh/h)	31	776	213	29	733	222	36	12	123	12	5	58
Number	1	6	16	5	2	12	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1810	1810	1900	1827	1827	1827	1900	1776	1776	1845	1845	1900
Adj Flow Rate, veh/h	34	862	237	32	814	247	40	13	137	13	6	64
Adj No. of Lanes	1	2	0	1	2	1	0	1	1	1	1	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	5	5	5	4	4	4	7	7	7	3	3	3
Cap, veh/h	342	1555	427	300	2024	906	302	85	359	331	32	345
Arrive On Green	0.58	0.58	0.58	0.58	0.58	0.58	0.24	0.24	0.24	0.24	0.24	0.24
Sat Flow, veh/h	515	2667	733	501	3471	1553	874	357	1509	1220	136	1452
Grp Volume(v), veh/h	34	555	544	32	814	247	53	0	137	13	0	70
Grp Sat Flow(s),veh/h/ln	515	1719	1680	501	1736	1553	1231	0	1509	1220	0	1588
Q Serve(g_s), s	2.6	13.3	13.3	2.8	8.5	5.3	1.3	0.0	5.1	0.6	0.0	2.4
Cycle Q Clear(g_c), s	11.1	13.3	13.3	16.2	8.5	5.3	3.6	0.0	5.1	4.2	0.0	2.4
Prop In Lane	1.00		0.44	1.00		1.00	0.75		1.00	1.00		0.91
Lane Grp Cap(c), veh/h	342	1002	980	300	2024	906	387	0	359	331	0	377
V/C Ratio(X)	0.10	0.55	0.55	0.11	0.40	0.27	0.14	0.00	0.38	0.04	0.00	0.19
Avail Cap(c_a), veh/h	472	1438	1406	427	2905	1299	511	0	496	443	0	522
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	10.6	8.6	8.6	13.6	7.6	6.9	20.9	0.0	21.4	22.6	0.0	20.3
Incr Delay (d2), s/veh	0.1	0.5	0.5	0.2	0.1	0.2	0.2	0.0	0.7	0.0	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	6.3	6.2	0.4	4.1	2.2	0.8	0.0	2.2	0.2	0.0	1.1
LnGrp Delay(d),s/veh	10.8	9.1	9.1	13.7	7.7	7.1	21.1	0.0	22.1	22.6	0.0	20.6
LnGrp LOS	В	Α	Α	В	Α	Α	С		С	С		С
Approach Vol, veh/h		1133			1093			190			83	
Approach Delay, s/veh		9.1			7.8			21.8			20.9	
Approach LOS		Α			А			С			С	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		45.0		21.9		45.0		21.9				
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0				
Max Green Setting (Gmax), s		56.0		22.0		56.0		22.0				
Max Q Clear Time (g_c+l1), s		18.2		7.1		15.3		6.2				
Green Ext Time (p_c), s		20.9		1.0		21.7		1.1				
Intersection Summary												
HCM 2010 Ctrl Delay			9.9									
HCM 2010 LOS			Α									

-	۶	<b>→</b>	`*	✓	<b>←</b>	•	1	†	<i>&gt;</i>	<b>/</b>	<b>+</b>	<b>√</b>
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	7	<b>↑</b> ↑		7	<b>^</b>	7		4	7	7	î»	
Volume (veh/h)	68	770	182	52	651	240	75	11	127	20	14	36
Number	1	6	16	5	2	12	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1827	1827	1900	1827	1827	1827	1900	1827	1827	1845	1845	1900
Adj Flow Rate, veh/h	76	856	202	58	723	267	83	12	141	22	16	40
Adj No. of Lanes	1	2	0	1	2	1	0	1	1	1	1	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	4	4	4	4	4	4	4	4	4	3	3	3
Cap, veh/h	372	1633	385	316	2033	910	350	44	367	297	111	277
Arrive On Green	0.59	0.59	0.59	0.59	0.59	0.59	0.24	0.24	0.24	0.24	0.24	0.24
Sat Flow, veh/h	555	2789	658	521	3471	1553	1056	186	1553	1217	468	1170
Grp Volume(v), veh/h	76	533	525	58	723	267	95	0	141	22	0	56
Grp Sat Flow(s),veh/h/ln	555	1736	1711	521	1736	1553	1242	0	1553	1217	0	1638
Q Serve(g_s), s	5.6	12.4	12.4	5.1	7.4	5.8	3.6	0.0	5.1	1.0	0.0	1.8
Cycle Q Clear(g_c), s	13.0	12.4	12.4	17.4	7.4	5.8	5.4	0.0	5.1	6.4	0.0	1.8
Prop In Lane	1.00		0.38	1.00		1.00	0.87		1.00	1.00		0.71
Lane Grp Cap(c), veh/h	372	1017	1002	316	2033	910	393	0	367	297	0	387
V/C Ratio(X)	0.20	0.52	0.52	0.18	0.36	0.29	0.24	0.00	0.38	0.07	0.00	0.14
Avail Cap(c_a), veh/h	507	1440	1420	443	2880	1288	516	0	506	406	0	534
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	10.7	8.4	8.4	13.6	7.3	7.0	22.2	0.0	21.6	24.5	0.0	20.4
Incr Delay (d2), s/veh	0.3	0.4	0.4	0.3	0.1	0.2	0.3	0.0	0.7	0.1	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	5.9	5.8	0.7	3.5	2.5	1.5	0.0	2.3	0.4	0.0	0.8
LnGrp Delay(d),s/veh	11.0	8.8	8.8	13.8	7.4	7.2	22.5	0.0	22.3	24.6	0.0	20.5
LnGrp LOS	В	А	Α	В	Α	Α	С		С	С		С
Approach Vol, veh/h		1134			1048			236			78	
Approach Delay, s/veh		8.9			7.7			22.4			21.7	
Approach LOS		Α			Α			С			С	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		45.5		22.0		45.5		22.0				
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0				
Max Green Setting (Gmax), s		56.0		22.0		56.0		22.0				
Max Q Clear Time (g_c+I1), s		19.4		7.4		15.0		8.4				
Green Ext Time (p_c), s		20.1		1.2		21.3		1.2				
Intersection Summary												
HCM 2010 Ctrl Delay			10.1									
HCM 2010 LOS			В									

	۶	<b>→</b>	*	<b>*</b>	<b>←</b>	•	1	†	~	<b>\</b>	<b>↓</b>	4
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	7	<b>†</b>	7	7	f)		14.54	<b>↑</b> ↑₽		7	ተተተ	7
Volume (veh/h)	19	29	228	80	7	9	498	992	169	18	902	47
Number	3	8	18	7	4	14	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1792	1792	1792	1597	1597	1900	1810	1810	1900	1810	1810	1810
Adj Flow Rate, veh/h	21	32	253	89	8	10	553	1102	188	20	1002	52
Adj No. of Lanes	1	1	1	1	1	0	2	3	0	1	3	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	6	6	6	19	19	19	5	5	5	5	5	5
Cap, veh/h	362	377	320	277	136	170	682	2179	372	70	1727	538
Arrive On Green	0.21	0.21	0.21	0.21	0.21	0.21	0.20	0.51	0.51	0.04	0.35	0.35
Sat Flow, veh/h	1337	1792	1524	934	646	808	3343	4250	725	1723	4940	1538
Grp Volume(v), veh/h	21	32	253	89	0	18	553	854	436	20	1002	52
Grp Sat Flow(s),veh/h/ln	1337	1792	1524	934	0	1454	1672	1647	1682	1723	1647	1538
Q Serve(g_s), s	1.0	1.1	12.0	6.5	0.0	0.8	12.0	13.0	13.0	0.9	12.6	1.7
Cycle Q Clear(g_c), s	1.7	1.1	12.0	7.5	0.0	0.8	12.0	13.0	13.0	0.9	12.6	1.7
Prop In Lane	1.00		1.00	1.00		0.56	1.00		0.43	1.00		1.00
Lane Grp Cap(c), veh/h	362	377	320	277	0	305	682	1689	862	70	1727	538
V/C Ratio(X)	0.06	0.08	0.79	0.32	0.00	0.06	0.81	0.51	0.51	0.28	0.58	0.10
Avail Cap(c_a), veh/h	397	424	360	302	0	344	1054	1946	994	204	1946	606
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.7	24.2	28.5	27.2	0.0	24.1	28.9	12.2	12.2	35.4	20.2	16.7
Incr Delay (d2), s/veh	0.1	0.1	10.2	0.7	0.0	0.1	2.8	0.2	0.5	2.2	0.3	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.6	5.9	1.7	0.0	0.3	5.8	5.9	6.0	0.4	5.7	0.7
LnGrp Delay(d),s/veh	24.8	24.3	38.7	27.9	0.0	24.1	31.7	12.4	12.7	37.6	20.5	16.7
LnGrp LOS	С	С	D	С		С	С	В	В	D	С	В
Approach Vol, veh/h		306			107			1843			1074	
Approach Delay, s/veh		36.2			27.3			18.3			20.7	
Approach LOS		D			C			В			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	21.5	32.6		22.0	9.1	45.0		22.0				
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s	24.0	30.0		18.0	9.0	45.0		18.0				
Max Q Clear Time (g_c+l1), s	14.0	14.6		9.5	2.9	15.0		14.0				
Green Ext Time (p_c), s	1.5	12.0		1.1	0.0	19.8		0.7				
Intersection Summary												
HCM 2010 Ctrl Delay			21.0									
HCM 2010 LOS			С									

	۶	<b>→</b>	•	•	<b>←</b>	•	1	†	~	-	<b>+</b>	4
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	ሻ		7	ሻ	₽		14.54	<b>↑</b> ↑₽		ሻ	<b>^</b>	7
Volume (veh/h)	45	4	443	186	12	10	268	965	74	5	851	29
Number	3	8	18	7	4	14	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1624	1624	1900	1827	1827	1900	1827	1827	1827
Adj Flow Rate, veh/h	50	4	492	207	13	11	298	1072	82	6	946	32
Adj No. of Lanes	1	1	1	1	1	0	2	3	0	1	3	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	17	17	17	4	4	4	4	4	4
Cap, veh/h	554	643	546	361	281	238	392	1946	149	24	1544	481
Arrive On Green	0.35	0.35	0.35	0.35	0.35	0.35	0.12	0.41	0.41	0.01	0.31	0.31
Sat Flow, veh/h	1381	1863	1583	783	814	689	3375	4727	361	1740	4988	1553
Grp Volume(v), veh/h	50	4	492	207	0	24	298	754	400	6	946	32
Grp Sat Flow(s),veh/h/ln	1381	1863	1583	783	0	1502	1688	1663	1763	1740	1663	1553
Q Serve(g_s), s	2.0	0.1	23.2	18.5	0.0	8.0	6.7	13.5	13.6	0.3	12.7	1.1
Cycle Q Clear(g_c), s	2.8	0.1	23.2	18.6	0.0	0.8	6.7	13.5	13.6	0.3	12.7	1.1
Prop In Lane	1.00		1.00	1.00		0.46	1.00		0.20	1.00		1.00
Lane Grp Cap(c), veh/h	554	643	546	361	0	519	392	1368	726	24	1544	481
V/C Ratio(X)	0.09	0.01	0.90	0.57	0.00	0.05	0.76	0.55	0.55	0.25	0.61	0.07
Avail Cap(c_a), veh/h	622	735	625	400	0	593	559	1368	726	199	1779	554
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	18.0	16.9	24.4	23.0	0.0	17.1	33.6	17.6	17.6	38.3	23.1	19.1
Incr Delay (d2), s/veh	0.1	0.0	14.9	1.6	0.0	0.0	3.8	0.5	0.9	5.1	0.5	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	0.1	12.3	4.1	0.0	0.4	3.4	6.3	6.7	0.2	5.9	0.5
LnGrp Delay(d),s/veh	18.1	16.9	39.3	24.6	0.0	17.1	37.4	18.1	18.5	43.4	23.6	19.2
LnGrp LOS	В	В	D	С		В	D	В	В	D	С	В
Approach Vol, veh/h		546			231			1452			984	
Approach Delay, s/veh		37.2			23.8			22.2			23.6	
Approach LOS		D			С			С			С	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	15.1	30.3		33.1	7.1	38.3		33.1				
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s	13.0	28.0		31.0	9.0	32.0		31.0				
Max Q Clear Time (g_c+l1), s	8.7	14.7		20.6	2.3	15.6		25.2				
Green Ext Time (p_c), s	0.4	9.6		2.7	0.0	11.8		1.9				
Intersection Summary												
HCM 2010 Ctrl Delay			25.3									
HCM 2010 LOS			С									

	۶	<b>→</b>	•	•	<b>←</b>	4	1	<b>†</b>	<i>&gt;</i>	<b>/</b>	<del> </del>	4
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				ሻሻ		7	14.54	ተተተ			ተተተ	7
Volume (veh/h)	0	0	0	475	0	296	235	1363	0	0	1073	137
Number				3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln				1727	0	1727	1776	1776	0	0	1810	1810
Adj Flow Rate, veh/h				528	0	329	261	1514	0	0	1192	152
Adj No. of Lanes				2	0	1	2	3	0	0	3	1
Peak Hour Factor				0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %				10	0	10	7	7	0	0	5	5
Cap, veh/h				845	0	389	373	2826	0	0	1942	605
Arrive On Green				0.26	0.00	0.26	0.11	0.58	0.00	0.00	0.39	0.39
Sat Flow, veh/h				3191	0	1468	3281	5007	0	0	5103	1538
Grp Volume(v), veh/h				528	0	329	261	1514	0	0	1192	152
Grp Sat Flow(s),veh/h/ln				1596	0	1468	1640	1616	0	0	1647	1538
Q Serve(g_s), s				11.5	0.0	16.7	6.0	14.9	0.0	0.0	15.2	5.2
Cycle Q Clear(g_c), s				11.5	0.0	16.7	6.0	14.9	0.0	0.0	15.2	5.2
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				845	0	389	373	2826	0	0	1942	605
V/C Ratio(X)				0.62	0.00	0.85	0.70	0.54	0.00	0.00	0.61	0.25
Avail Cap(c_a), veh/h				1092	0	503	499	3134	0	0	2067	643
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	1.00	1.00	1.00	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh				25.5	0.0	27.5	33.7	10.0	0.0	0.0	19.1	16.1
Incr Delay (d2), s/veh				0.8	0.0	10.2	2.8	0.2	0.0	0.0	0.5	0.2
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				5.1	0.0	7.9	2.9	6.6	0.0	0.0	6.9	2.3
LnGrp Delay(d),s/veh				26.3	0.0	37.6	36.4	10.1	0.0	0.0	19.6	16.3
LnGrp LOS				С		D	D	В			В	В
Approach Vol, veh/h					857			1775			1344	
Approach Delay, s/veh					30.6			14.0			19.3	
Approach LOS					С			В			В	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		52.0			15.0	37.0		26.9				
Change Period (Y+Rc), s		6.0			6.0	6.0		6.0				
Max Green Setting (Gmax), s		51.0			12.0	33.0		27.0				
Max Q Clear Time (g_c+l1), s		16.9			8.0	17.2		18.7				
Green Ext Time (p_c), s		26.4			0.3	13.8		2.2				
Intersection Summary												
HCM 2010 Ctrl Delay			19.4									
HCM 2010 LOS			В									

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				ሻሻ		7	14.54	ተተተ			ተተተ	7
Volume (veh/h)	0	0	0	608	0	254	531	1053	0	0	1251	229
Number				3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln				1759	0	1759	1810	1810	0	0	1827	1827
Adj Flow Rate, veh/h				676	0	282	590	1170	0	0	1390	254
Adj No. of Lanes				2	0	1	2	3	0	0	3	1
Peak Hour Factor				0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %				8	0	8	5	5	0	0	4	4
Cap, veh/h				769	0	354	672	3082	0	0	1761	548
Arrive On Green				0.24	0.00	0.24	0.20	0.62	0.00	0.00	0.35	0.35
Sat Flow, veh/h				3250	0	1495	3343	5103	0	0	5152	1553
Grp Volume(v), veh/h				676	0	282	590	1170	0	0	1390	254
Grp Sat Flow(s), veh/h/ln				1625	0	1495	1672	1647	0	0	1663	1553
Q Serve(g_s), s				17.2	0.0	15.3	14.7	10.0	0.0	0.0	21.5	10.9
Cycle Q Clear(g_c), s				17.2	0.0	15.3	14.7	10.0	0.0	0.0	21.5	10.9
Prop In Lane				1.00	0.0	1.00	1.00	10.0	0.00	0.00	21.0	1.00
Lane Grp Cap(c), veh/h				769	0	354	672	3082	0	0	1761	548
V/C Ratio(X)				0.88	0.00	0.80	0.88	0.38	0.00	0.00	0.79	0.46
Avail Cap(c_a), veh/h				831	0	382	738	3216	0	0	1797	560
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	1.00	1.00	1.00	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh				31.6	0.0	30.9	33.3	8.0	0.0	0.0	25.0	21.5
Incr Delay (d2), s/veh				10.1	0.0	10.5	10.9	0.1	0.0	0.0	2.4	0.6
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				8.8	0.0	7.3	7.8	4.6	0.0	0.0	10.2	4.7
LnGrp Delay(d),s/veh				41.8	0.0	41.4	44.3	8.1	0.0	0.0	27.4	22.1
LnGrp LOS				D	0.0	D	D	A	0.0	0.0	C	C
Approach Vol, veh/h					958			1760			1644	
Approach Delay, s/veh					41.7			20.2			26.6	
Approach LOS					T1.7			20.2 C			20.0 C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2			5	6	,	8				
Phs Duration (G+Y+Rc), s		59.7			23.3	36.4		26.4				
Change Period (Y+Rc), s		6.0			6.0	6.0		6.0				
Max Green Setting (Gmax), s		56.0			19.0	31.0		22.0				
Max Q Clear Time (g_c+l1), s		12.0			16.7	23.5		19.2				
Green Ext Time (p_c), s		30.8			0.6	6.9		1.1				
W = 7:		00.0			0.0	0.0		1.1				
Intersection Summary			07.0									
HCM 2010 Ctrl Delay			27.3									
HCM 2010 LOS			С									

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4	7	ሻ	ĵ∍		7	<b>↑</b>	7		र्सी	
Volume (veh/h)	8	75	321	110	38	8	238	336	213	13	181	30
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1827	1827	1827	1827	1900	1776	1776	1776	1900	1810	1900
Adj Flow Rate, veh/h	9	83	357	122	42	9	264	373	237	14	201	33
Adj No. of Lanes	0	1	1	1	1	0	1	1	1	0	2	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	4	4	4	4	4	4	7	7	7	5	5	5
Cap, veh/h	66	393	583	452	600	129	500	770	654	67	572	91
Arrive On Green	0.23	0.23	0.23	0.11	0.41	0.41	0.15	0.43	0.43	0.21	0.21	0.21
Sat Flow, veh/h	64	1738	1553	1740	1459	313	1691	1776	1509	74	2766	441
Grp Volume(v), veh/h	92	0	357	122	0	51	264	373	237	131	0	117
Grp Sat Flow(s),veh/h/ln	1802	0	1553	1740	0	1772	1691	1776	1509	1713	0	1569
Q Serve(g_s), s	0.0	0.0	14.4	3.7	0.0	1.3	8.8	11.7	8.2	0.0	0.0	5.0
Cycle Q Clear(g_c), s	3.2	0.0	14.4	3.7	0.0	1.3	8.8	11.7	8.2	4.8	0.0	5.0
Prop In Lane	0.10		1.00	1.00		0.18	1.00		1.00	0.11		0.28
Lane Grp Cap(c), veh/h	458	0	583	452	0	729	500	770	654	406	0	324
V/C Ratio(X)	0.20	0.00	0.61	0.27	0.00	0.07	0.53	0.48	0.36	0.32	0.00	0.36
Avail Cap(c_a), veh/h	561	0	673	602	0	985	948	1492	1268	631	0	547
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	24.4	0.0	19.6	17.3	0.0	13.8	17.9	15.7	14.7	26.2	0.0	26.3
Incr Delay (d2), s/veh	0.2	0.0	1.3	0.3	0.0	0.0	0.9	0.5	0.3	0.5	0.0	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.6	0.0	6.4	1.8	0.0	0.7	4.2	5.8	3.4	2.4	0.0	2.2
LnGrp Delay(d),s/veh	24.6	0.0	20.9	17.6	0.0	13.8	18.8	16.2	15.1	26.7	0.0	27.0
LnGrp LOS	С		С	В		В	В	В	В	С		С
Approach Vol, veh/h		449			173			874			248	
Approach Delay, s/veh		21.7			16.5			16.7			26.8	
Approach LOS		С			В			В			С	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2	3	4	5	6		8				
Phs Duration (G+Y+Rc), s		39.5	14.3	23.5	17.5	22.0		37.8				
Change Period (Y+Rc), s		6.0	6.0	6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s		65.0	15.0	22.0	32.0	27.0		43.0				
Max Q Clear Time (g_c+I1), s		13.7	5.7	16.4	10.8	7.0		3.3				
Green Ext Time (p_c), s		5.1	0.2	1.1	0.7	4.5		2.1				
Intersection Summary												
HCM 2010 Ctrl Delay			19.4									
HCM 2010 LOS			В									

	۶	<b>→</b>	*	<b>*</b>	<b>←</b>	*	•	†	~	<b>&gt;</b>	<b>↓</b>	4
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		ર્ની	7	7	f)		7	<b>↑</b>	7		414	
Volume (veh/h)	18	53	390	185	64	6	260	250	166	4	316	29
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1845	1845	1845	1845	1900	1810	1810	1810	1900	1827	1900
Adj Flow Rate, veh/h	20	59	433	206	71	7	289	278	184	4	351	32
Adj No. of Lanes	0	1	1	1	1	0	1	1	1	0	2	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	3	3	3	3	3	3	5	5	5	4	4	4
Cap, veh/h	123	323	603	460	685	68	460	787	669	48	630	57
Arrive On Green	0.23	0.23	0.23	0.11	0.41	0.41	0.16	0.44	0.44	0.20	0.20	0.20
Sat Flow, veh/h	294	1428	1568	1757	1653	163	1723	1810	1538	9	3138	283
Grp Volume(v), veh/h	79	0	433	206	0	78	289	278	184	204	0	183
Grp Sat Flow(s), veh/h/ln	1722	0	1568	1757	0	1816	1723	1810	1538	1817	0	1613
Q Serve(g_s), s	0.0	0.0	18.0	6.7	0.0	2.1	9.9	8.2	6.1	0.0	0.0	8.1
Cycle Q Clear(g_c), s	2.8	0.0	18.0	6.7	0.0	2.1	9.9	8.2	6.1	8.0	0.0	8.1
Prop In Lane	0.25		1.00	1.00		0.09	1.00		1.00	0.02		0.18
Lane Grp Cap(c), veh/h	446	0	603	460	0	752	460	787	669	411	0	324
V/C Ratio(X)	0.18	0.00	0.72	0.45	0.00	0.10	0.63	0.35	0.27	0.50	0.00	0.56
Avail Cap(c_a), veh/h	446	0	603	658	0	957	878	1499	1274	681	0	567
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	24.9	0.0	20.8	18.4	0.0	14.3	19.0	15.0	14.4	28.6	0.0	28.7
Incr Delay (d2), s/veh	0.2	0.0	4.1	0.7	0.0	0.1	1.4	0.3	0.2	0.9	0.0	1.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	0.0	8.7	3.3	0.0	1.1	4.8	4.2	2.6	4.1	0.0	3.7
LnGrp Delay(d),s/veh	25.1	0.0	24.9	19.1	0.0	14.3	20.4	15.3	14.7	29.6	0.0	30.2
LnGrp LOS	С		С	В		В	С	В	В	С		С
Approach Vol, veh/h		512			284			751			387	
Approach Delay, s/veh		24.9			17.8			17.1			29.9	
Approach LOS		С			В			В			С	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2	3	4	5	6		8				
Phs Duration (G+Y+Rc), s		40.7	15.0	24.0	18.7	22.0		39.0				
Change Period (Y+Rc), s		6.0	6.0	6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s		66.0	18.0	18.0	32.0	28.0		42.0				
Max Q Clear Time (g_c+l1), s		10.2	8.7	20.0	11.9	10.1		4.1				
Green Ext Time (p_c), s		5.1	0.4	0.0	0.8	4.3		2.6				
Intersection Summary												
HCM 2010 Ctrl Delay			21.8									
HCM 2010 LOS			С									

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	ሻ	<b>^</b>			<b>↑</b> ↑		44		7			
Volume (vph)	132	867	0	0	454	121	301	0	51	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0			6.0		6.0		6.0			
Lane Util. Factor	1.00	0.95			0.95		0.97		1.00			
Frt	1.00	1.00			0.97		1.00		0.85			
Flt Protected	0.95	1.00			1.00		0.95		1.00			
Satd. Flow (prot)	1671	3343			3268		2943		1357			
Flt Permitted	0.34	1.00			1.00		0.95		1.00			
Satd. Flow (perm)	594	3343			3268		2943		1357			
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	147	963	0	0	504	134	334	0	57	0	0	0
RTOR Reduction (vph)	0	0	0	0	20	0	0	0	46	0	0	0
Lane Group Flow (vph)	147	963	0	0	618	0	334	0	11	0	0	0
Heavy Vehicles (%)	8%	8%	8%	7%	7%	7%	19%	19%	19%	2%	2%	2%
Turn Type	custom	NA			NA		Prot		Prot			
Protected Phases	58	258			6		7		7			
Permitted Phases	2						7		7			
Actuated Green, G (s)	73.2	73.2			45.2		22.7		22.7			
Effective Green, g (s)	73.2	73.2			45.2		22.7		22.7			
Actuated g/C Ratio	0.63	0.63			0.39		0.19		0.19			
Clearance Time (s)					6.0		6.0		6.0			
Vehicle Extension (s)					3.0		3.0		3.0			
Lane Grp Cap (vph)	657	2093			1263		571		263			
v/s Ratio Prot	0.06	c0.29			c0.19		c0.11		0.01			
v/s Ratio Perm	0.08											
v/c Ratio	0.22	0.46			0.49		0.58		0.04			
Uniform Delay, d1	9.3	11.5			27.1		42.8		38.3			
Progression Factor	0.96	0.84			1.00		1.00		1.00			
Incremental Delay, d2	0.1	0.1			0.3		1.5		0.1			
Delay (s)	9.0	9.7			27.4		44.4		38.3			
Level of Service	Α	Α			С		D		D			
Approach Delay (s)		9.6			27.4			43.5			0.0	
Approach LOS		Α			С			D			Α	
Intersection Summary												
HCM 2000 Control Delay			21.1	Н	CM 2000	Level of S	Service		С			
HCM 2000 Volume to Capa	acity ratio		0.53									
Actuated Cycle Length (s)			116.9	S	um of lost	time (s)			24.0			
Intersection Capacity Utilization	ation		76.5%		CU Level o				D			
Analysis Period (min)			15									

c Critical Lane Group

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	Ť	<b>^</b>			<b>↑</b> ↑		44		7			
Volume (vph)	257	623	0	0	748	295	309	0	105	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0			6.0		6.0		6.0			
Lane Util. Factor	1.00	0.95			0.95		0.97		1.00			
Frt	1.00	1.00			0.96		1.00		0.85			
Flt Protected	0.95	1.00			1.00		0.95		1.00			
Satd. Flow (prot)	1703	3406			3292		3072		1417			
Flt Permitted	0.12	1.00			1.00		0.95		1.00			
Satd. Flow (perm)	220	3406			3292		3072		1417			
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	286	692	0	0	831	328	343	0	117	0	0	0
RTOR Reduction (vph)	0	0	0	0	35	0	0	0	100	0	0	0
Lane Group Flow (vph)	286	692	0	0	1124	0	343	0	17	0	0	0
Heavy Vehicles (%)	6%	6%	6%	5%	5%	5%	14%	14%	14%	2%	2%	2%
Turn Type	custom	NA			NA		Prot		Prot			
Protected Phases	5 8	258			6		7		7			
Permitted Phases	2						7		7			
Actuated Green, G (s)	74.2	74.2			49.6		17.1		17.1			
Effective Green, g (s)	74.2	74.2			49.6		17.1		17.1			
Actuated g/C Ratio	0.63	0.63			0.42		0.15		0.15			
Clearance Time (s)					6.0		6.0		6.0			
Vehicle Extension (s)					3.0		3.0		3.0			
Lane Grp Cap (vph)	548	2160			1395		448		207			
v/s Ratio Prot	c0.14	0.20			c0.34		c0.11		0.01			
v/s Ratio Perm	0.19											
v/c Ratio	0.52	0.32			0.81		0.77		0.08			
Uniform Delay, d1	18.3	9.8			29.5		48.0		43.2			
Progression Factor	2.25	0.77			1.00		1.00		1.00			
Incremental Delay, d2	0.7	0.1			3.5		7.6		0.2			
Delay (s)	41.9	7.7			33.0		55.7		43.3			
Level of Service	D	Α			С		Е		D			
Approach Delay (s)		17.7			33.0			52.5			0.0	
Approach LOS		В			С			D			Α	
Intersection Summary												
HCM 2000 Control Delay			30.7	Н	CM 2000	Level of S	Service		С			
HCM 2000 Volume to Capa	acity ratio		0.75									
Actuated Cycle Length (s)			117.0	S	um of lost	time (s)			24.0			
Intersection Capacity Utiliz	ation		68.2%		CU Level o				С			
Analysis Period (min)			15									

c Critical Lane Group

Movement         EBL         EBR         EBR         WBL         WBT         WBR         NBL         NBT         NBR         SBL         SBR         SBR           Lane Configurations         1 <t< th=""></t<>
Volume (vph)         0         678         585         71         684         0         0         0         321         0         229           Ideal Flow (vphpl)         1900         19
Volume (vph)         0         678         585         71         684         0         0         0         321         0         229           Ideal Flow (vphpl)         1900         19
Total Lost time (s)       6.0       6.0       6.0       6.0       6.0         Lane Util. Factor       0.95       1.00       1.00       0.95
Lane Util. Factor 0.95 1.00 1.00 0.95 1.00 1.00 1.00
Frt 1.00 0.85 1.00 1.00 1.00 1.00 1.00
Fit Protected 1.00 1.00 0.95 1.00 0.95 1.00
Satd. Flow (prot) 3312 1482 1671 3343 1612 1442
Flt Permitted 1.00 1.00 0.22 1.00 0.95 1.00
Satd. Flow (perm)         3312         1482         386         3343         1612         1442
Peak-hour factor, PHF 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.9
Adj. Flow (vph) 0 753 650 79 760 0 0 0 357 0 254
RTOR Reduction (vph) 0 0 132 0 0 0 0 0 0 88
Lane Group Flow (vph) 0 753 518 79 760 0 0 0 357 0 166
Heavy Vehicles (%) 9% 9% 8% 8% 8% 2% 2% 12% 12% 12%
Turn Type NA custom custom NA custom custom
Protected Phases 2 1 1 6 7 8 7 8
Permitted Phases 2 7 8 6 7 8
Actuated Green, G (s) 42.2 92.9 57.2 57.2 44.7 44.7
Effective Green, g (s) 42.2 92.9 57.2 57.2 44.7 44.7
Actuated g/C Ratio 0.36 0.79 0.49 0.49 0.38 0.38
Clearance Time (s) 6.0 6.0
Vehicle Extension (s) 3.0 3.0
Lane Grp Cap (vph) 1195 1177 320 1635 616 551
v/s Ratio Prot c0.23 0.03 c0.23 c0.22 0.12
v/s Ratio Perm 0.35 0.10
v/c Ratio 0.63 0.44 0.25 0.46 0.58 0.30
Uniform Delay, d1 30.9 3.8 17.6 19.7 28.6 25.2
Progression Factor 1.00 1.00 0.43 1.15 1.00 1.00
Incremental Delay, d2 1.1 0.3 0.4 0.2 1.3 0.3
Delay (s) 32.0 4.1 7.9 22.9 30.0 25.5
Level of Service C A A C C
Approach Delay (s) 19.0 21.4 0.0 28.1
Approach LOS B C A C
Intersection Summary
HCM 2000 Control Delay 21.7 HCM 2000 Level of Service C
HCM 2000 Volume to Capacity ratio 0.63
Actuated Cycle Length (s) 116.9 Sum of lost time (s) 24.0
Intersection Capacity Utilization 76.5% ICU Level of Service D
Analysis Period (min) 15

c Critical Lane Group

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		<b>^</b>	7	ሻ	<b>^</b>					7		7
Volume (vph)	0	699	406	102	955	0	0	0	0	181	0	196
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0	6.0	6.0					6.0		6.0
Lane Util. Factor		0.95	1.00	1.00	0.95					1.00		1.00
Frt		1.00	0.85	1.00	1.00					1.00		0.85
Flt Protected		1.00	1.00	0.95	1.00					0.95		1.00
Satd. Flow (prot)		3343	1495	1703	3406					1570		1404
Flt Permitted		1.00	1.00	0.19	1.00					0.95		1.00
Satd. Flow (perm)		3343	1495	345	3406					1570		1404
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	777	451	113	1061	0	0	0	0	201	0	218
RTOR Reduction (vph)	0	0	116	0	0	0	0	0	0	0	0	91
Lane Group Flow (vph)	0	777	335	113	1061	0	0	0	0	201	0	127
Heavy Vehicles (%)	8%	8%	8%	6%	6%	6%	2%	2%	2%	15%	15%	15%
Turn Type		NA	custom	custom	NA					custom		custom
Protected Phases		2		1	16					78		7 8
Permitted Phases			278	6						78		7 8
Actuated Green, G (s)		41.9	87.0	65.9	65.9					39.1		39.1
Effective Green, g (s)		41.9	87.0	65.9	65.9					39.1		39.1
Actuated g/C Ratio		0.36	0.74	0.56	0.56					0.33		0.33
Clearance Time (s)		6.0		6.0								
Vehicle Extension (s)		3.0		3.0								
Lane Grp Cap (vph)		1197	1111	403	1918					524		469
v/s Ratio Prot		c0.23		0.04	c0.31					c0.13		0.09
v/s Ratio Perm			0.22	0.11								
v/c Ratio		0.65	0.30	0.28	0.55					0.38		0.27
Uniform Delay, d1		31.4	5.0	14.5	16.2					29.7		28.5
Progression Factor		1.00	1.00	0.83	0.95					1.00		1.00
Incremental Delay, d2		1.2	0.2	0.2	0.2					0.5		0.3
Delay (s)		32.6	5.1	12.2	15.6					30.2		28.8
Level of Service		С	Α	В	В					С		С
Approach Delay (s)		22.5			15.3			0.0			29.5	
Approach LOS		С			В			Α			С	
Intersection Summary												
HCM 2000 Control Delay			20.5	Н	ICM 2000	Level of S	Service		С			
HCM 2000 Volume to Capacity	ratio		0.58									
Actuated Cycle Length (s)			117.0	S	um of lost	time (s)			24.0			
Intersection Capacity Utilization			68.2%	10	CU Level o	of Service			С			
Analysis Period (min)			15									

c Critical Lane Group

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	7	<b>^</b>	7	7	ħβ		7	<b>^</b>	7	7	<b>^</b>	7
Volume (veh/h)	149	213	262	175	109	57	449	1129	275	36	568	81
Number	3	8	18	7	4	14	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1792	1792	1792	1776	1776	1900	1810	1810	1810	1810	1810	1810
Adj Flow Rate, veh/h	166	237	291	194	121	63	499	1254	306	40	631	90
Adj No. of Lanes	1	2	1	1	2	0	1	2	1	1	2	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	6	6	6	7	7	7	5	5	5	5	5	5
Cap, veh/h	281	626	627	318	719	354	538	1913	856	156	931	416
Arrive On Green	0.18	0.18	0.18	0.09	0.33	0.33	0.23	0.56	0.56	0.27	0.27	0.27
Sat Flow, veh/h	1150	3406	1524	1691	2193	1080	1723	3438	1538	320	3438	1538
Grp Volume(v), veh/h	166	237	291	194	91	93	499	1254	306	40	631	90
Grp Sat Flow(s),veh/h/ln	1150	1703	1524	1691	1687	1585	1723	1719	1538	320	1719	1538
Q Serve(g_s), s	14.3	6.3	14.4	9.0	4.0	4.3	20.4	26.5	11.4	10.8	17.0	4.7
Cycle Q Clear(g_c), s	14.3	6.3	14.4	9.0	4.0	4.3	20.4	26.5	11.4	10.8	17.0	4.7
Prop In Lane	1.00		1.00	1.00		0.68	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	281	626	627	318	553	520	538	1913	856	156	931	416
V/C Ratio(X)	0.59	0.38	0.46	0.61	0.17	0.18	0.93	0.66	0.36	0.26	0.68	0.22
Avail Cap(c_a), veh/h	335	787	699	318	633	595	692	2284	1022	162	993	444
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	40.5	37.2	22.2	30.5	24.8	24.9	20.5	16.1	12.8	31.6	33.8	29.3
Incr Delay (d2), s/veh	2.0	0.4	0.5	3.4	0.1	0.2	16.2	0.5	0.3	0.9	1.7	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.7	3.0	6.2	1.1	1.9	1.9	12.0	12.5	4.9	1.0	8.3	2.0
LnGrp Delay(d),s/veh	42.4	37.6	22.8	33.9	24.9	25.1	36.7	16.6	13.0	32.4	35.6	29.6
LnGrp LOS	D	D	С	С	С	С	D	В	В	С	D	С
Approach Vol, veh/h		694			378			2059			761	
Approach Delay, s/veh		32.5			29.6			20.9			34.7	
Approach LOS		С			С			С			С	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4		6	7	8				
Phs Duration (G+Y+Rc), s	29.7	34.1		40.1		63.8	15.0	25.1				
Change Period (Y+Rc), s	6.0	6.0		6.0		6.0	6.0	6.0				
Max Green Setting (Gmax), s	33.0	30.0		39.0		69.0	9.0	24.0				
Max Q Clear Time (g_c+I1), s	22.4	19.0		6.3		28.5	11.0	16.4				
Green Ext Time (p_c), s	1.3	9.1		4.6		24.3	0.0	2.7				
Intersection Summary												
HCM 2010 Ctrl Delay			26.5									
HCM 2010 LOS			С									

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	ሻ	<b>^</b>	7	7	ħβ		7	<b>^</b>	7	7	<b>^</b>	7
Volume (veh/h)	78	123	492	254	277	63	310	751	158	25	1047	102
Number	3	8	18	7	4	14	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1810	1810	1810	1810	1810	1900	1827	1827	1827	1827	1827	1827
Adj Flow Rate, veh/h	87	137	547	282	308	70	344	834	176	28	1163	113
Adj No. of Lanes	1	2	1	1	2	0	1	2	1	1	2	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	5	5	5	5	5	5	4	4	4	4	4	4
Cap, veh/h	201	485	460	308	812	182	375	2095	937	277	1362	609
Arrive On Green	0.14	0.14	0.14	0.10	0.29	0.29	0.16	0.60	0.60	0.39	0.39	0.39
Sat Flow, veh/h	972	3438	1538	1723	2792	626	1740	3471	1553	545	3471	1553
Grp Volume(v), veh/h	87	137	547	282	188	190	344	834	176	28	1163	113
Grp Sat Flow(s),veh/h/ln	972	1719	1538	1723	1719	1699	1740	1736	1553	545	1736	1553
Q Serve(g_s), s	9.6	4.0	16.0	11.0	9.9	10.1	15.4	14.2	5.8	3.7	34.7	5.4
Cycle Q Clear(g_c), s	9.6	4.0	16.0	11.0	9.9	10.1	15.4	14.2	5.8	3.7	34.7	5.4
Prop In Lane	1.00		1.00	1.00		0.37	1.00		1.00	1.00	-	1.00
Lane Grp Cap(c), veh/h	201	485	460	308	500	494	375	2095	937	277	1362	609
V/C Ratio(X)	0.43	0.28	1.19	0.92	0.38	0.38	0.92	0.40	0.19	0.10	0.85	0.19
Avail Cap(c_a), veh/h	201	485	460	308	500	494	453	2294	1026	284	1407	629
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	46.0	43.6	39.8	41.2	32.0	32.1	29.7	11.7	10.1	22.1	31.5	22.6
Incr Delay (d2), s/veh	1.5	0.3	104.9	30.7	0.5	0.5	21.1	0.1	0.1	0.2	5.2	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.6	1.9	27.8	6.2	4.8	4.8	12.7	6.8	2.5	0.6	17.6	2.3
LnGrp Delay(d),s/veh	47.5	43.9	144.6	71.9	32.5	32.6	50.8	11.9	10.2	22.2	36.7	22.7
LnGrp LOS	D	D	F	E	С	С	D	В	В	С	D	С
Approach Vol, veh/h		771			660			1354			1304	
Approach Delay, s/veh		115.8			49.4			21.5			35.2	
Approach LOS		F			D			C			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4		6	7	8				
Phs Duration (G+Y+Rc), s	23.9	50.5		39.0		74.5	17.0	22.0				
Change Period (Y+Rc), s	6.0	6.0		6.0		6.0	6.0	6.0				
Max Green Setting (Gmax), s	23.0	46.0		33.0		75.0	11.0	16.0				
Max Q Clear Time (g_c+l1), s	17.4	36.7		12.1		16.2	13.0	18.0				
Green Ext Time (p_c), s	0.5	7.8		5.8		28.9	0.0	0.0				
Intersection Summary												
HCM 2010 Ctrl Delay			48.2									
HCM 2010 LOS			D									

Intersection								
nt Delay, s/veh	0.7							
·								
Movement	WBL	WBR			NBT	NBR	SBL	SBT
Vol, veh/h	19	18			221	25	29	278
Conflicting Peds, #/hr	0	0			0	0	0	0
Sign Control	Stop	Stop			Free	Free	Free	Free
RT Channelized	-	None			-	None	-	None
Storage Length	0	200			-	-	250	-
Veh in Median Storage, #	0	-			0	-	-	0
Grade, %	0	-			0	-	-	0
Peak Hour Factor	90	90			90	90	90	90
Heavy Vehicles, %	10	10			8	8	3	3
Mvmt Flow	21	20			246	28	32	309
Major/Minor	Minor1				Major1		Major2	
Conflicting Flow All	478	137			0	0	273	0
Stage 1	259	-			-	-	-	-
Stage 2	219	_			-	-	-	-
Critical Hdwy	7	7.1			-	-	4.16	-
Critical Hdwy Stg 1	6	-			-	-	-	-
Critical Hdwy Stg 2	6	-			-	-	-	-
Follow-up Hdwy	3.6	3.4			-	-	2.23	-
Pot Cap-1 Maneuver	497	862			-	-	1280	-
Stage 1	737	-			-	-	-	-
Stage 2	773	-			-	-	-	-
Platoon blocked, %					-	-		-
Mov Cap-1 Maneuver	485	862			-	-	1280	-
Mov Cap-2 Maneuver	485	-			-	-	-	-
Stage 1	737	-			-	-	-	-
Stage 2	754	-			-	-	-	-
Approach	WB				NB		SB	
HCM Control Delay, s	11.1							
HCM LOS	В							
Minor Lane/Major Mvmt	NBT	NBR WBLn1	WBLn2	SBL	SBT			
Capacity (veh/h)	-	- 485	862	1280	-			
HCM Lane V/C Ratio	_	- 0.044	0.023	0.025	-			
HCM Control Delay (s)	-	- 12.8	9.3	7.9	-			
HCM Lane LOS	_	- B	Α	Α	-			
HCM 95th %tile Q(veh)	-	- 0	0	0	_			

Intersection								
Int Delay, s/veh	0.7							
Movement	WBL	WBR			NBT	NBR	SBL	SBT
Vol, veh/h	18	19			264	29	25	250
Conflicting Peds, #/hr	0	0			0	0	0	0
Sign Control	Stop	Stop			Free	Free	Free	Free
RT Channelized	-	None			-	None	-	None
Storage Length	0	200			-	-	250	-
Veh in Median Storage, #	0	-			0	-	-	0
Grade, %	0	-			0	-	-	0
Peak Hour Factor	90	90			90	90	90	90
Heavy Vehicles, %	9	9			6	6	3	3
Mvmt Flow	20	21			293	32	28	278
Major/Minor	Minor1				Major1		Major2	
Conflicting Flow All	503	163			0	0	326	0
Stage 1	309	-			-	-	-	-
Stage 2	194	-			-	-	-	-
Critical Hdwy	6.98	7.08			-	-	4.16	-
Critical Hdwy Stg 1	5.98	-			-	-	-	-
Critical Hdwy Stg 2	5.98	-			-	-	-	-
Follow-up Hdwy	3.59	3.39			-	-	2.23	-
Pot Cap-1 Maneuver	481	831			-	-	1223	-
Stage 1	697	-			-	-	-	-
Stage 2	799	-			-	-	-	-
Platoon blocked, %					-	-		-
Mov Cap-1 Maneuver	470	831			-	-	1223	-
Mov Cap-2 Maneuver	470	-			-	-	-	-
Stage 1	697	-			-	-	-	-
Stage 2	781	-			-	-	-	-
Approach	WB				NB		SB	
HCM Control Delay, s	11.2							
HCM LOS	В							
Minor Lane/Major Mvmt	NBT	NBR WBLn1	WBLn2	SBL	SBT			
Capacity (veh/h)	-	- 470	831	1223	-			
HCM Lane V/C Ratio	<u>-</u>	- 0.043	0.025	0.023	-			
HCM Control Delay (s)	-	- 13	9.4	8	-			
HCM Lane LOS	-	- B	А	А	-			
HCM 95th %tile Q(veh)	-	- 0	0	0	-			

	•	*	†	~	<b>\</b>	ļ	
Movement	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations	7	7	ħβ		ሻ	^↑	
Volume (veh/h)	145	131	115	311	209	88	
Number	3	18	2	12	1	6	
nitial Q (Qb), veh	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	
Adj Sat Flow, veh/h/ln	1638	1638	1792	1900	1759	1759	
Adj Flow Rate, veh/h	161	146	128	346	232	98	
Adj No. of Lanes	1	1	2	0	1	2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	
Percent Heavy Veh, %	16	16	6	6	8	8	
Cap, veh/h	242	216	1158	1036	632	2272	
Arrive On Green	0.16	0.16	0.68	0.68	0.68	0.68	
Sat Flow, veh/h	1560	1392	1792	1524	865	3431	
Grp Volume(v), veh/h	161	146	128	346	232	98	
Grp Sat Flow(s),veh/h/ln	1560	1392	1703	1524	865	1671	
Q Serve(g_s), s	5.6	5.7	1.5	5.4	8.7	0.6	
Cycle Q Clear(g_c), s	5.6	5.7	1.5	5.4	14.1	0.6	
Prop In Lane	1.00	1.00	1.0	1.00	1.00	0.0	
ane Grp Cap(c), veh/h	242	216	1158	1036	632	2272	
//C Ratio(X)	0.66	0.67	0.11	0.33	0.37	0.04	
Avail Cap(c_a), veh/h	380	339	1158	1036	632	2272	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	
Jpstream Filter(I)	1.00	1.00	0.99	0.99	1.00	1.00	
Jniform Delay (d), s/veh	22.9	22.9	3.2	3.8	6.7	3.0	
ncr Delay (d2), s/veh	3.1	3.6	0.2	0.9	1.6	0.0	
nitial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),veh/ln	2.6	2.4	0.7	2.5	2.3	0.3	
nGrp Delay(d),s/veh	26.0	26.5	3.4	4.7	8.4	3.1	
_nGrp LOS	20.0 C	20.5 C	Α	Α.	Α	Α	
Approach Vol, veh/h	307	0	474	7.1	71	330	
Approach Delay, s/veh	26.2		4.3			6.8	
Approach LOS	20.2 C		4.5 A			Α	
Timer	1_	2	3	4	5	6	7 8
Assigned Phs		2				6	8
Phs Duration (G+Y+Rc), s		45.1				45.1	14.9
Change Period (Y+Rc), s		6.0				6.0	6.0
Max Green Setting (Gmax), s		34.0				34.0	14.0
Max Q Clear Time (g_c+l1), s		7.4				16.1	7.7
Green Ext Time (p_c), s		5.5				4.9	0.5
ntersection Summary							
ICM 2010 Ctrl Delay			11.1				
ICM 2010 LOS			В				
HCM 2010 LOS			В				

	1	*	†	~	<b>\</b>	<b>+</b>	
Movement	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations	7	7	<b>↑</b> ↑		ሻ	<b>^</b>	
Volume (veh/h)	314	211	82	147	133	135	
Number	3	18	2	12	1	6	
Initial Q (Qb), veh	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	
Adj Sat Flow, veh/h/ln	1681	1681	1810	1900	1792	1792	
Adj Flow Rate, veh/h	349	234	91	163	148	150	
Adj No. of Lanes	1	1	2	0	1	2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	
Percent Heavy Veh, %	13	13	5	5	6	6	
Cap, veh/h	434	387	1052	941	743	2085	
Arrive On Green	0.27	0.27	0.61	0.61	0.61	0.61	
Sat Flow, veh/h	1601	1429	1810	1538	1079	3495	
Grp Volume(v), veh/h	349	234	91	163	148	150	
Grp Sat Flow(s),veh/h/ln	1601	1429	1719	1538	1079	1703	
Q Serve(g_s), s	11.0	7.8	1.2	2.5	3.8	1.0	
Cycle Q Clear(g_c), s	11.0	7.8	1.2	2.5	6.3	1.0	
Prop In Lane	1.00	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	434	387	1052	941	743	2085	
V/C Ratio(X)	0.80	0.60	0.09	0.17	0.20	0.07	
Avail Cap(c_a), veh/h	766	684	1052	941	743	2085	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	
Uniform Delay (d), s/veh	18.5	17.3	4.3	4.6	5.9	4.3	
Incr Delay (d2), s/veh	3.5	1.5	0.2	0.4	0.6	0.1	
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),veh/ln	5.3	3.2	0.6	1.1	1.2	0.5	
LnGrp Delay(d),s/veh	22.0	18.8	4.5	5.0	6.5	4.3	
LnGrp LOS	С	В	Α	Α	Α	Α	
Approach Vol, veh/h	583		254			298	
Approach Delay, s/veh	20.7		4.8			5.4	
Approach LOS	С		Α			А	
Timer	1	2	3	4	5	6	7 8
Assigned Phs		2				6	8
Phs Duration (G+Y+Rc), s		39.3				39.3	20.7
Change Period (Y+Rc), s		6.0				6.0	6.0
Max Green Setting (Gmax), s		22.0				22.0	26.0
Max Q Clear Time (g_c+I1), s		4.5				8.3	13.0
Green Ext Time (p_c), s		2.9				2.6	1.7
Intersection Summary							
ICM 2010 Ctrl Delay			13.1				
HCM 2010 LOS			В				

	۶	7	1	†	<b>+</b>	4
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	ሻሻ	7	ሻ	<b>^</b>	<b>↑</b> 1>	
Volume (veh/h)	156	7	7	270	143	90
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1696	1696	1845	1845	1792	1900
Adj Flow Rate, veh/h	173	8	8	300	159	100
Adj No. of Lanes	2	1	1	2	2	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	12	12	3	3	6	6
·	483	222	904	2535	1487	885
Cap, veh/h Arrive On Green	0.15	0.15	0.72	0.72	0.72	0.72
Sat Flow, veh/h	3134	1442	1105	3597	2145	1224
Grp Volume(v), veh/h	173	8	8	300	130	129
Grp Sat Flow(s),veh/h/ln	1567	1442	1105	1752	1703	1577
Q Serve(g_s), s	2.7	0.3	0.1	1.4	1.3	1.3
Cycle Q Clear(g_c), s	2.7	0.3	1.5	1.4	1.3	1.3
Prop In Lane	1.00	1.00	1.00			0.78
Lane Grp Cap(c), veh/h	483	222	904	2535	1232	1140
V/C Ratio(X)	0.36	0.04	0.01	0.12	0.11	0.11
Avail Cap(c_a), veh/h	1088	501	904	2535	1232	1140
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.94	0.94	1.00	1.00	0.94	0.94
Uniform Delay (d), s/veh	20.7	19.7	2.5	2.3	2.3	2.3
Incr Delay (d2), s/veh	0.4	0.1	0.0	0.1	0.2	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	0.1	0.0	0.7	0.6	0.6
LnGrp Delay(d),s/veh	21.1	19.8	2.5	2.4	2.4	2.5
LnGrp LOS	C C	В	Α.5	Α.	Α.	Α.5
Approach Vol, veh/h	181	ט	Λ.	308	259	
• •						
Approach Delay, s/veh	21.1			2.4	2.4	
Approach LOS	С			Α	Α	
Timer	1	2	3	4	5	6
Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		45.6		14.4		45.6
Change Period (Y+Rc), s		6.0		6.0		6.0
Max Green Setting (Gmax), s		29.0		19.0		29.0
Max Q Clear Time (g_c+l1), s		3.5		4.7		3.3
Green Ext Time (p_c), s		3.6		0.5		3.6
		3.0		3.0		3.0
Intersection Summary			0.0			
HCM 2010 Ctrl Delay			6.9			
HCM 2010 LOS			Α			

	۶	7	1	†	<b>+</b>	4
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	ሻሻ	7	ሻ	<b>^</b>	<b>∱</b> Ъ	
Volume (veh/h)	83	11	7	146	284	165
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1727	1727	1863	1863	1810	1900
Adj Flow Rate, veh/h	92	12	8	162	316	183
Adj No. of Lanes	2	1	1	2	2	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	10	10	2	2	5	5
Cap, veh/h	415	191	794	2624	1570	889
Arrive On Green	0.13	0.13	0.74	0.74	1.00	1.00
	3191	1468	895	3632	2209	1199
Sat Flow, veh/h						
Grp Volume(v), veh/h	92	12	8	162	255	244
Grp Sat Flow(s),veh/h/ln	1596	1468	895	1770	1719	1598
Q Serve(g_s), s	1.4	0.4	0.1	0.7	0.0	0.0
Cycle Q Clear(g_c), s	1.4	0.4	0.1	0.7	0.0	0.0
Prop In Lane	1.00	1.00	1.00			0.75
Lane Grp Cap(c), veh/h	415	191	794	2624	1274	1185
V/C Ratio(X)	0.22	0.06	0.01	0.06	0.20	0.21
Avail Cap(c_a), veh/h	985	453	794	2624	1274	1185
HCM Platoon Ratio	1.00	1.00	1.00	1.00	2.00	2.00
Upstream Filter(I)	0.96	0.96	1.00	1.00	0.84	0.84
Uniform Delay (d), s/veh	21.5	21.0	1.9	1.9	0.0	0.0
Incr Delay (d2), s/veh	0.3	0.1	0.0	0.0	0.3	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	0.2	0.0	0.3	0.1	0.1
LnGrp Delay(d),s/veh	21.7	21.1	1.9	2.0	0.3	0.3
LnGrp LOS	C	C	Α	Α	Α	Α
Approach Vol, veh/h	104		71	170	499	7.
Approach Delay, s/veh	21.6			2.0	0.3	
Approach LOS	21.0 C			2.0 A	0.5 A	
Approach LOS	C			А	А	
Timer	1	2	3	4	5	6
Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		46.8		13.2		46.8
Change Period (Y+Rc), s		6.0		6.0		6.0
Max Green Setting (Gmax), s		31.0		17.0		31.0
Max Q Clear Time (g_c+l1), s		2.7		3.4		2.0
Green Ext Time (p_c), s		4.4		0.2		4.4
Intersection Summary						
HCM 2010 Ctrl Delay			3.5			
•						
HCM 2010 LOS			Α			

Intersection								
Int Delay, s/veh	0.1							
Movement	EBL		EBR	NBL	. NE	BT	SBT	SBR
Vol, veh/h	0		0	4	2	77	27	123
Conflicting Peds, #/hr	0		0	0		0	0	0
Sign Control	Stop		Stop	Free	Fr	ee	Free	Free
RT Channelized	-		None	-	No	ne	-	None
Storage Length	0		-	-		-	-	0
Veh in Median Storage, #	0		-	-		0	0	-
Grade, %	0		-	-		0	0	-
Peak Hour Factor	90		90	90		90	90	90
Heavy Vehicles, %	2		2	2		2	3	3
Mvmt Flow	0		0	4	3	08	30	137
Major/Minor	Minor2			Major1			Major2	
Conflicting Flow All	193		30	30		0	-	0
Stage 1	30		-	-		-	-	-
Stage 2	163		-	-		-	-	_
Critical Hdwy	6.63		6.23	4.12		-	-	-
Critical Hdwy Stg 1	5.43		-	-		-	-	-
Critical Hdwy Stg 2	5.83		-	-		-	-	-
Follow-up Hdwy	3.519		3.319	2.218		-	-	-
Pot Cap-1 Maneuver	787		1044	1583		-	-	-
Stage 1	992		-	-		-	-	-
Stage 2	850		-	-		-	-	-
Platoon blocked, %						-	-	-
Mov Cap-1 Maneuver	785		1044	1583		-	-	-
Mov Cap-2 Maneuver	785		-	-		-	-	_
Stage 1	992		-	-		-	-	-
Stage 2	847		-	-		-	-	-
Approach	EB			NB			SB	
HCM Control Delay, s	0			0.1				
HCM LOS	A							
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT SBR				
Capacity (veh/h)	1583	-	-					
HCM Lane V/C Ratio	0.003	_	_					
HCM Control Delay (s)	7.3	0	0					
HCM Lane LOS	A	A	A					
HCM 95th %tile Q(veh)	0	-	-					

Intersection								
Int Delay, s/veh	0.1							
Movement	EBL		EBR	NB	L	NBT	SBT	SBR
Vol, veh/h	0		0		4	153	8	287
Conflicting Peds, #/hr	0		0		0	0	0	0
Sign Control	Stop		Stop	Fre	е	Free	Free	Free
RT Channelized	-		None		-	None	-	None
Storage Length	0		-		-	-	-	0
Veh in Median Storage, #	0		-		-	0	0	-
Grade, %	0		-		-	0	0	-
Peak Hour Factor	90		90	9		90	90	90
Heavy Vehicles, %	2		2		4	4	2	2
Mvmt Flow	0		0		4	170	9	319
Major/Minor	Minor2			Major	1		Major2	
Conflicting Flow All	103		9		9	0	-	0
Stage 1	9		-		-	-	-	-
Stage 2	94		-		-	-	-	-
Critical Hdwy	6.63		6.23	4.1	4	-	-	-
Critical Hdwy Stg 1	5.43		-		-	-	-	-
Critical Hdwy Stg 2	5.83		-		-	-	-	-
Follow-up Hdwy	3.519		3.319	2.23	6	-	-	-
Pot Cap-1 Maneuver	890		1072	159	8	-	-	-
Stage 1	1014		-		-	-	-	-
Stage 2	920		-		-	-	-	-
Platoon blocked, %						-	-	-
Mov Cap-1 Maneuver	887		1072	159	8	-	-	-
Mov Cap-2 Maneuver	887		-		-	-	-	-
Stage 1	1014		-		-	-	-	-
Stage 2	917		-		-	-	-	-
Approach	EB			NI	В		SB	
HCM Control Delay, s	0			0.				
HCM LOS	A							
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT SBI	7			
Capacity (veh/h)	1598	-	-	-	-			
HCM Lane V/C Ratio	0.003	_	_	-	_			
HCM Control Delay (s)	7.3	0	0	-	_			
HCM Lane LOS	A	A	A		_			
HCM 95th %tile Q(veh)	0	-	-	-	-			

Int Delay, s/veh	9.3									
	V.V									
Movement	EBL	EBT	EBR		WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	267	4	4		4	0	6	0	8	4
Conflicting Peds, #/hr	0	0	0		0	0	0	0	0	0
Sign Control	Stop	Stop	Stop		Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	None		-	-	None	-	-	None
Storage Length	-	-	-		-	-	-	-	-	-
Veh in Median Storage, #	-	0	-		-	0	-	-	0	-
Grade, %	-	0	-		-	0	-	-	0	-
Peak Hour Factor	90	90	90		90	90	90	90	90	90
Heavy Vehicles, %	2	2	2		2	2	2	2	2	2
Mvmt Flow	297	4	4		4	0	7	0	9	4
Major/Minor	Minor2				Minor1			Major1		
Conflicting Flow All	48	47	26		50	45	11	26	0	0
Stage 1	34	34	-		11	11	-	-	-	-
Stage 2	14	13	-		39	34	-	-	-	-
Critical Hdwy	7.12	6.52	6.22		7.12	6.52	6.22	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-		6.12	5.52	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-		6.12	5.52	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318		3.518	4.018	3.318	2.218	-	-
Pot Cap-1 Maneuver	953	845	1050		950	847	1070	1588	-	-
Stage 1	982	867	-		1010	886	-	-	-	-
Stage 2	1006	885	-		976	867	-	-	-	-
Platoon blocked, %									-	-
Mov Cap-1 Maneuver	945	843	1050		940	845	1070	1588	-	-
Mov Cap-2 Maneuver	945	843	-		940	845	-	-	-	-
Stage 1	982	865	-		1010	886	-	-	-	-
Stage 2	1000	885	-		964	865	-	-	-	-
Approach	EB				WB			NB		
HCM Control Delay, s	10.6				8.6					
HCM LOS	В				Α					
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR		
Capacity (veh/h)	1588	-	-	945	1014	1606	-	-		
HCM Lane V/C Ratio	-	-	-	0.323	0.011	0.003	-	-		
HCM Control Delay (s)	0	-	-	10.6	8.6	7.2	-	-		
HCM Lane LOS	А	-	-	В	Α	Α	-	-		
HCM 95th %tile Q(veh)	0	-	-	1	0	0	-	-		

Intersection			
Int Delay, s/veh			
in Delay, 3/Ven			
Movement	SBL	SBT	SBR
Vol, veh/h	4	23	0
Conflicting Peds, #/hr	0	0	0
Sign Control	Free	Free	Free
RT Channelized	-	-	None
Storage Length	0	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	90	90	90
Heavy Vehicles, %	2	2	2
Mvmt Flow	4	26	0
Major/Minor	Majaro		
Major/Minor	Major2		
Conflicting Flow All	13	0	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.12	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.218	-	-
Pot Cap-1 Maneuver	1606	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	1606	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-
<b>0</b>			
Approach	SB		
HCM Control Delay, s			
HCM LOS			
NAI			
Minor Lane/Major Mvmt			

Int Delay, s/veh	8.2									
Movement	EBL	EBT	EBR		WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	140	4	4		4	0	6	0	11	4
Conflicting Peds, #/hr	0	0	0		0	0	0	0	0	0
Sign Control	Stop	Stop	Stop		Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	None		-	-	None	-	-	None
Storage Length	-	-	-		-	-	-	-	-	-
Veh in Median Storage, #	-	0	-		-	0	-	-	0	-
Grade, %	-	0	-		-	0	-	-	0	-
Peak Hour Factor	90	90	90		90	90	90	90	90	90
Heavy Vehicles, %	4	4	4		2	2	2	2	2	2
Mvmt Flow	156	4	4		4	0	7	0	12	4
Major/Minor	Minor2				Minor1			Major1		
Conflicting Flow All	31	30	4		32	27	14	4	0	0
Stage 1	13	13	-		14	14	-	-	-	-
Stage 2	18	17	-		18	13	-	-	-	-
Critical Hdwy	7.14	6.54	6.24		7.12	6.52	6.22	4.12	-	-
Critical Hdwy Stg 1	6.14	5.54	-		6.12	5.52	-	-	-	-
Critical Hdwy Stg 2	6.14	5.54	-		6.12	5.52	-	-	-	-
Follow-up Hdwy	3.536	4.036	3.336		3.518	4.018	3.318	2.218	-	-
Pot Cap-1 Maneuver	972	859	1074		976	866	1066	1618	-	-
Stage 1	1002	881	-		1006	884	-	-	-	-
Stage 2	996	877	-		1001	885	-	-	-	-
Platoon blocked, %									-	-
Mov Cap-1 Maneuver	964	857	1074		966	864	1066	1618	-	-
Mov Cap-2 Maneuver	964	857	-		966	864	-	-	-	-
Stage 1	1002	879	-		1006	884	-	-	-	-
Stage 2	990	877	-		989	883	-	-	-	-
Approach	EB				WB			NB		
HCM Control Delay, s	9.5				8.6					
HCM LOS	А				Α					
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR		
Capacity (veh/h)	1618	-	-	963	1024	1587	-	-		
HCM Lane V/C Ratio	-	-	-	0.171	0.011	0.003	-	-		
HCM Control Delay (s)	0	-	-	9.5	8.6	7.3	-	-		
HCM Lane LOS	А	-	-	Α	Α	Α	-	-		
HCM 95th %tile Q(veh)	0	-	_	1	0	0	-	-		

Intersection				
Int Delay, s/veh				
•				
Movement	SBL	SBT	SBR	
Vol, veh/h	4	4	0	
Conflicting Peds, #/hr	0	0	0	
Sign Control	Free	Free	Free	
RT Channelized	-	-	None	
Storage Length	0	_	-	
Veh in Median Storage, #	-	0	-	
Grade, %	-	0	-	
Peak Hour Factor	90	90	90	
Heavy Vehicles, %	4	4	4	
Mvmt Flow	4	4	0	
Major/Minor	Majaro			
Major/Minor	Major2	0	0	
Conflicting Flow All	17	0	0	
Stage 1	-	-	-	
Stage 2	4.14	-	-	
Critical Hdwy		-	-	
Critical Houry Stg 1	-	-	-	
Critical Hdwy Stg 2 Follow-up Hdwy	2.236	-	-	
Pot Cap-1 Maneuver	1587	-	-	
Stage 1	1007	-	-	
Stage 2	-	-	-	
Platoon blocked, %	<u>-</u>	-	-	
Mov Cap-1 Maneuver	1587	-	-	
Mov Cap-2 Maneuver	1307		_	
Stage 1	<u>-</u>	_	_	
Stage 2	-	_	_	
Jugo 2				
	65			
Approach	SB			
HCM Control Delay, s				
HCM LOS				
Minor Lane/Major Mvmt				
•				

General In	formation		S AND RAM	Site Infor						
Analyst	AJR	)	Е.	reeway/Dir of Tr		Cosgro	vo ND			
Agency or Comp				unction			Off to I-26	ED		
ate Performed	=	5/2014		urisdiction		7010-1	011 10 1-20	LD		
nalysis Time P		Peak		nalysis Year		2018 B	uild - River	Center Site		
	ion Navy Base IC		7.0	naryolo roar		2010 B	ulia Ttivol	CONTON CITO		
nputs	,									
Upstream A	ıdi Ramn	Freeway Num	ber of Lanes, N	3					Downstre	am Adi
<u>.</u>	_	Ramp Number	of Lanes, N	1					Ramp	amraj
□Yes	□ On	Acceleration L	ane Length, L <sub>A</sub>						□Yes	On
✓ No	Off	Deceleration L	ane Length L <sub>D</sub>	125					✓No	Off
_	_	Freeway Volui	me, V <sub>F</sub>	2886						
L <sub>up</sub> =	ft	Ramp Volume	, V <sub>R</sub>	854					L <sub>down</sub> =	ft
\/ -	a la /la	Freeway Free	Flow Speed, $S_{\rm FF}$	55.0					V <sub>D</sub> =	veh/h
$V_u =$	veh/h	Ramp Free-Flo	ow Speed, S <sub>FR</sub>	45.0					l D	VCII/II
conversio	n to pc/h Un	der Base (	Conditions							
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	$\top$	f <sub>HV</sub>	fp	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>
reeway	2886	0.90	Level	10	0	_	952	1.00		367
Ramp	854	0.90	Level	12	0	_	943	1.00		006
JpStream		+				<del> </del>				
DownStream										
		Merge Areas						Diverge Areas		
stimation	of v <sub>12</sub>				Estimat	ion o	f v <sub>12</sub>			
	V <sub>12</sub> = V <sub>1</sub>	F(P <sub>FM</sub> )					V <sub>12</sub> =	: V <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>	R)P <sub>FD</sub>	
EQ =	(Equ	ation 13-6 or	13-7)		L <sub>EQ</sub> =			Equation 13-1	–	3)
FM =		g Equation (E			P <sub>FD</sub> =			630 using Equ		
12 =	pc/h		,		V <sub>12</sub> =			192 pc/h		,
<sub>3</sub> or V <sub>av34</sub>	•	(Equation 13-	.14 or 13 <sub>-</sub> 17)		V <sub>3</sub> or V <sub>av34</sub>			75 pc/h (Equa	tion 13-1/	or 13 <sub>-</sub> 17)
	2,700 pc/h? ☐ Y€		14 01 10 17)			> 2.7		∃Yes ☑ No	11011 110-11-	· Oi 13-17)
	1.5 * V <sub>12</sub> /2  \(\text{\backgray}\) \(\text{Y}\)							Yes ✓ No		
			-16, 13-18, or		"			⊒ Yes 💌 No oc/h (Equation	13 16 13	110 or 13
Yes,V <sub>12a</sub> =	13-19	· ·	10, 13-10, 01		If Yes,V <sub>12a</sub> =			9)	15-10, 10	)-10, UI 13
Capacity C	Checks	,			Capacit	y Che	ecks	,		
	Actual	С	apacity	LOS F?			Actual	Ca	pacity	LOS F
					V <sub>F</sub>		3367	Exhibit 13-8	6750	No
$V_{FO}$		Exhibit 13-8		1	$V_{FO} = V_{F}$	- V <sub>D</sub>	2361	Exhibit 13-8	6750	No
10					V <sub>R</sub>	- 1	1006	Exhibit 13-1		No
low Ento	ring Merge II	nfluonoo A	roo			torin		rge Influen		110
TOW LINE	Actual		Desirable	Violation?	FIOW EII	_	Actual	Max Desirab		Violation
V <sub>R12</sub>	7101001	Exhibit 13-8	Scolidbio	Violation:	V <sub>12</sub>	$\overline{}$	492	Exhibit 13-8	4400:All	No
	ervice Deter		f not E		+			terminatio		
									<u> </u>	<i>r)</i>
	+ 0.00734 v <sub>R</sub> +	0.0078 V <sub>12</sub> -	0.00627 L <sub>A</sub>					.0086 V <sub>12</sub> - 0.	009 L <sub>D</sub>	
$_{R}$ = (pc/m					l ''	1.6 (pc/	,			
` _	ibit 13-2)				_	`	oit 13-2)			
peed Det	ermination				Speed L	Deter	minatio	on		
	it 13-11)				$D_s = 0.$	389 (E	xhibit 13-	-12)		
l <sub>s</sub> = (Exib	•				S <sub>R</sub> = 49	9.9 mph	(Exhibit	13-12)		
	Exhibit 13-11)				LK TO		`	- /		
R= mph (	Exhibit 13-11) Exhibit 13-11)						` (Exhibit	•		
$_{\rm R}^{\rm =}$ mph ( $_{\rm 0}^{\rm =}$ mph (	Exhibit 13-11) Exhibit 13-11) Exhibit 13-13)				S <sub>0</sub> = 60	).3 mph	•	13-12)		

		RAMP	S AND RAM	IP JUNCTI	ONS WO	RKS	HEET			
General Info	rmation			Site Infor	mation					
Analyst	AJR		Fr	reeway/Dir of Tr	avel	Cosgro	ve NB			
Agency or Company	y Atkin	IS	Ju	unction		7010 -	Off to I-26	EB		
Date Performed	3/20/	/2014	Jι	urisdiction						
Analysis Time Perio	od PM F	<sup>o</sup> eak	Aı	nalysis Year		2018 B	uild - Rive	r Center Site		
Project Description	Navy Base IC	TF								
Inputs										
Upstream Adj F	Ramp	1 '	ber of Lanes, N	3					Downstrea	am Adj
□Yes [	□On	Ramp Numbe		1					Ramp	
□ 162 L		1	ane Length, L <sub>A</sub>						Yes	On
✓ No	Off	1	ane Length L <sub>D</sub>	125					✓ No	Off
L <sub>up</sub> =	ft	Freeway Volume		1972 461					L <sub>down</sub> =	ft
_up		1							down	
V,, = \	/eh/h	1	-Flow Speed, S <sub>FF</sub>	55.0					V <sub>D</sub> =	veh/h
u ·		Ramp Free-Fl	ow Speed, S <sub>FR</sub>	45.0						
Conversion t	to pc/h Un	der Base (	Conditions							
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		$f_{HV}$	f <sub>p</sub>	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>
Freeway	1972	0.90	Level	8	0	0.	962	1.00	22	279
Ramp	461	0.90	Level	19	0	0.	913	1.00	5	61
UpStream										
DownStream										
		Merge Areas						Diverge Areas		
Estimation of v <sub>12</sub>					Estimat	ion o	f v <sub>12</sub>			
$V_{12} = V_F (P_{FM})$							V <sub>40</sub> =	V <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>	)P <sub>E</sub>	
L <sub>EQ</sub> = (Equation 13-6 or 13-7)				L <sub>EQ</sub> =			Equation 13-1		)	
		Equation (E						-		
P <sub>FM</sub> =	_	Equation (E	_XIIIDIL 13-0)		P <sub>FD</sub> =			677 using Equ	iation (Exil	DIL 13-1)
/ <sub>12</sub> =	pc/h				V <sub>12</sub> =			724 pc/h		
$V_3$ or $V_{av34}$			-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>			55 pc/h (Equa	tion 13-14	or 13-17)
Is $V_3$ or $V_{av34} > 2,7$					Is V <sub>3</sub> or V <sub>av3</sub>	<sub>34</sub> > 2,7	00 pc/h? [	☐Yes ☑No		
Is $V_3$ or $V_{av34} > 1.5$	* V <sub>12</sub> /2 ☐ Ye	s 🗌 No			Is V <sub>3</sub> or V <sub>av3</sub>	<sub>34</sub> > 1.5	* V <sub>12</sub> /2 [	☐ Yes 🗹 No		
f Yes,V <sub>12a</sub> =			-16, 13-18, or		If Yes,V <sub>12a</sub> =	:		c/h (Equation	13-16, 13	-18, or 13
	13-19)	)			120			9)		
Capacity Ch	-				Capacit	y Che				
	Actual	C	apacity	LOS F?			Actual		pacity	LOS F
					V <sub>F</sub>		2279	Exhibit 13-8	6750	No
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$	- V <sub>R</sub>	1718	Exhibit 13-8	6750	No
					$V_R$		561	Exhibit 13-10	2100	No
Flow Enterin	a Merae Ir	fluence A	rea		_	terin	a Dive	rge Influen	ce Area	
	Actual		Desirable	Violation?	1	_	Actual	Max Desirab		Violation
V <sub>R12</sub>	110100	Exhibit 13-8	20002.0	7101040111	V <sub>12</sub>	$\overline{}$	724	Exhibit 13-8	4400:All	No
	vice Deter		if not E		+					
Level of Service Determination (if not F)								termination		<u>r)</u>
	$D_R = 5.475 + 0.00734 \text{ v}_R + 0.0078 \text{ V}_{12} - 0.00627 \text{ L}_A$				1			.0086 V <sub>12</sub> - 0.0	noa r <sup>D</sup>	
$D_R = 5.475 + 0$					_ ··	3.0 (pc/	,			
$D_{R} = 5.475 + 0$	•	· · · · · · · · · · · · · · · · · · ·				<u> </u>	it 13-2)			
$D_R = 5.475 + 0$ $D_R = (pc/mi/lr$ $D_R = (Exhibit)$	13-2)				Speed Determination					
$D_R = 5.475 + 0$ $D_R = (pc/mi/lr$ $D_R = (Exhibit)$	13-2)				Speed D	<u>Jeter</u>	<u>IIIIIau</u>	)II		
$D_R = 5.475 + 0$ $D_R = (pc/mi/lr$ $D_R = (Exhibit)$ Speed Determines	13-2) mination						chibit 13			
$D_R = 5.475 + 0$ $D_R = (pc/mi/lit)$ $D_R = (Exhibit)$ $D_R = (Exhibit)$ $D_R = (Exhibit)$ $D_R = (Exhibit)$	13-2) <b>mination</b> 13-11)				$D_{s} = 0.3$	348 (E	khibit 13	-12)		
$D_{\rm R}$ = 5.475 + 0 $D_{\rm R}$ = (pc/mi/lr $D_{\rm R}$ = (Exhibit) $D_{\rm R}$ = (Exibit 1) $D_{\rm R}$ = mph (Exi	13-2) mination 13-11) hibit 13-11)				$D_s = 0.0$ $S_R = 50$	348 (E: ).5 mph	khibit 13 (Exhibit	-12) 13-12)		
$D_R = 5.475 + 0$ $D_R = (pc/mi/lr)$ $D_R = (pc/mi$	13-2) <b>mination</b> 13-11)				$D_s = 0.3$ $S_R = 50$ $S_0 = 60$	348 (E: ).5 mph ).3 mph	khibit 13	-12) 13-12) 13-12)		

Navy Base ICTF

			REEWA	WEAV			I			
Genera	I Informati	on			Site Info	rmation				
Analyst Agency/Co Date Perfo Analysis Ti Proiect De	rmed	AJR Atkins 7/25/20 AM Pe			Freeway/Dir of Travel Weaving Segment Location Analysis Year  Cosgrove NB 7020-I-26 EB On to I-26 WB 0 2018 Build - River Center Site					
Inputs	oonpaon mary B	400 10 11								
Weaving number of lanes, N Weaving segment length, $\rm L_S$ 450				45 mph	Freeway max Terrain type		C-D Roadway Multilan Highway 1 225 Leve			
Convei		1	1	II .	ı .			Ι,	1 ( (1)	
,	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	f <sub>HV</sub>	fp	v (pc/h)	
V <sub>FF</sub>	1173	0.90	9	0	1.5	1.2	0.957	1.00	1362	
V <sub>RF</sub>	293	0.90	9	0	1.5	1.2	0.957	1.00	340	
$V_{FR}$	859	0.90	19	0	1.5	1.2	0.913	1.00	1045	
$V_{RR}$	0	0.90	0	0	1.5	1.2	1.000	1.00	0	
$V_{NW}$	1362							V =	2747	
V <sub>W</sub>	1385									
VR	0.504									
Config	uration Cha	aracteris	tics		1					
Minimum r	maneuver lanes,	$N_{WL}$		2 lc	Minimum weaving lane changes, LC <sub>MIN</sub> 138					
	je density, ID			0.2 int/mi	The state of the s					
	RF lane changes,	IXI		1 lc/pc	Non-weaving		0 lc/h			
Minimum F	R lane changes,	, LC <sub>FR</sub>		1 lc/pc	Total lane ch	nanges, LC <sub>ALI</sub>	_		1473 lc/h	
Minimum F	RR lane changes	, LC <sub>RR</sub>		lc/pc	Non-weaving vehicle index, I <sub>NW</sub> 1					
Weavir	ng Segmen	t Speed,	Density, I	_evel of	Service,	and Cap	acity			
Weaving s	egment flow rate	, V		2747 pc/h		ensity factor,			0.576	
Weaving s	segment capacity, c <sub>w</sub> 4555 veh/h				Weaving seg		32.9 mph 34.0 mph			
	Neaving segment v/c ratio 0.57					1				
•	segment density,	D	20	0.9 pc/mi/ln	Average non		1111		31.7 mph	
	ervice, LOS			В	Maximum weaving length, L <sub>MAX</sub> 7875					
Chapter 13,	segments longer t "Freeway Merge a	han the calcula and Diverge Se	ated maximum le	ength should	oe treated as is	solated merge	and diverge are	eas using the	procedures of	

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HCS 2010<sup>TM</sup> Version 6.41

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Navy Base ICTF

General Informa	ation			/ING WORKSHEET Site Information						
General informa	ation			Site inio	rmation	<u> </u>				
Analyst Agency/Company Date Performed Analysis Time Period				Freeway/Dir of Travel Weaving Segment Location Analysis Year  Cosgrove NB 7020-I-26 EB On to I-26 WI 2018 Build - River Center S						
Project Description Nav	y Base ICTF									
Inputs				,						
Weaving configuration Weaving number of lane				I HIGH						
Weaving segment lengthereevay free-flow speed	0		450ft 45 mph	Freeway min	nimum speed	I, S <sub>MIN</sub>		1		
reeway free-flow speed	, 110		45 Пірп	Freeway max	ximum capa	city, C <sub>IFL</sub>		225		
Conversions to	nc/h Unde	r Rasa Co	ndition	Terrain type				Lev		
V (veh/h)	PHF	Truck (%)	RV (%)	Ε <sub>T</sub>	E <sub>R</sub>	f <sub>HV</sub>	fp	v (pc/h)		
V <sub>FF</sub> 726	0.90	7	0	1.5	1.2	0.966	1.00	835		
V <sub>RF</sub> 140	0.90	14	0	1.5	1.2	0.935	1.00	166		
V <sub>FR</sub> 785	0.90	18	0	1.5	1.2	0.917	1.00	951		
V <sub>RR</sub> 0	0.90	0	0	1.5	1.2	1.000	1.00	0		
V <sub>NW</sub> 835			•	•	•		V =	1952		
V <sub>W</sub> 1117							•			
VR 0.572										
Configuration C	haracteris	tics								
Minimum maneuver land	es, N <sub>WL</sub>		2 lc	Minimum weaving lane changes, LC <sub>MIN</sub> 11						
Interchange density, ID			0.2 int/mi	i Weaving lane changes, LC <sub>w</sub>						
Minimum RF lane chang	TG.			Non-weaving lane changes, LC <sub>NW</sub>						
Minimum FR lane chang	111		1 lc/pc	Total lane ch	nanges, LC <sub>Al</sub>	LL		1205 lc/		
Minimum RR lane chang	ges, LC <sub>RR</sub>		lc/pc	Non-weaving vehicle index, I <sub>NW</sub>						
Weaving Segme	ent Speed,	Density, I	Level of	II .						
Weaving segment flow r			1952 pc/h	Weaving into	•			0.49		
Weaving segment capac	**		4052 veh/h	Weaving seg	•			34.9 mp 35.1 mp		
Weaving segment v/c ra		1.	0.465	*		34.6 mp				
weaving segment densi Level of Service, LOS	aving segment density, D 14.0 pc/mi/lel of Service, LOS B			n Average non-weaving speed, $S_{NW}$ Maximum weaving length, $L_{MAX}$						
				IVIGAIIIIUIII W	Caving Ichigi	II, ∟MAX		8683		
Notos										
Notes a. Weaving segments long Chapter 13, "Freeway Mer			ength should b	oe treated as is	solated merge	and diverge are	eas using the	procedures of		

			MPS AND	RAMP JUN			EET			
Genera	I Infori	mation			Site Infor	mation				
Analyst		AJR		Fi	reeway/Dir of Tr	avel	Cosgrove I	NB		
Agency or C	' '	Atkin			unction		7030 - NB	On from I-26 WB		
Date Perfor			2014		urisdiction					
Analysis Tin				A	nalysis Year		2018 Build	- River Center Site		
	cription	Navy Base ICT	IF							
nputs			Fra access Nicons	han of Lanca N						
Jpstream A	dj Ramp		1 '	ber of Lanes, N	3				Downstr	eam Adj
Yes	On		Ramp Number		1				Ramp	
⊥ res			Acceleration L	ane Length, L <sub>A</sub>	200				☐Yes	On
✓ No	Off		Deceleration L	ane Length L <sub>D</sub>					☑ No	Off
	_ 0		Freeway Volum	ne, V <sub>F</sub>	1466				INO INO	
up =	ft		Ramp Volume	, V <sub>D</sub>	387				L <sub>down</sub> =	ft
				Flow Speed, S <sub>FF</sub>	55.0					
′ <sub>u</sub> =	veh/h		1	ow Speed, S <sub>FR</sub>	45.0				V <sub>D</sub> =	veh/h
Convor	cion to	nc/h Hn		Conditions	70.0					
onver	SIOII LC	<i>γ</i> γ γ γ γ γ γ γ γ γ γ γ γ γ γ γ γ γ γ		Jonanions	1	1	1			
(pc/l	h)	(Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	, f <sub>p</sub>	v = V/PH	$HF \times f_{HV} \times f_{p}$
Freeway		1466	0.90	Level	9	0	0.957			1702
Ramp		387	0.90	Level	10	0	0.952			452
JpStream										
DownStrea	m									
			Merge Areas					Diverge Area	s	
stimat	stimation of v <sub>12</sub>					Estimat	ion of v	12		
		V <sub>12</sub> = V <sub>F</sub>	( P <sub>EM</sub> )					V <sub>12</sub> = V <sub>R</sub> + (V <sub>F</sub> - '	\/ \D	
=			ation 13-6 or	13-7)		_				40)
L <sub>EQ</sub> = (Equation 13-6 or 13-7)  P <sub>FM</sub> = 0.583 using Equation (Exhibit 13-6)				)	L <sub>EQ</sub> =		(Equation 1			
' <sub>12</sub> =		992 p		IOTT (EXTIIDIT TO 0	,	P <sub>FD</sub> =		using Equa	ition (Exhibit	13-7)
				n 13-14 or 13-		V <sub>12</sub> =		pc/h		
$'_3$ or $V_{av34}$		17)	om (Equation	1 13-14 01 13-		V <sub>3</sub> or V <sub>av34</sub>		pc/h (Equatio		-17)
s V <sub>3</sub> or V <sub>av</sub>	, <sub>34</sub> > 2,700	0 pc/h? Ye	s 🗹 No			Is V <sub>3</sub> or V <sub>av3</sub>	<sub>34</sub> > 2,700 բ	oc/h? 🗌 Yes 🔲 N	10	
		V <sub>12</sub> /2 ☐ Ye				Is V <sub>3</sub> or V <sub>av3</sub>	<sub>34</sub> > 1.5 * V	<sub>12</sub> /2 □Yes □N	10	
				-16, 13-18, or		If Yes,V <sub>12a</sub> =	:	pc/h (Equa	tion 13-16,	13-18, or
Yes,V <sub>12a</sub> :		13-19)				12a		13-19)		
Capacit	ty Che	cks				Capacit	y Chec	ks		
		Actual	C	apacity	LOS F?		,	Actual	Capacity	LOS F?
					1	$V_{F}$		Exhibit 1	13-8	
V <sub>F</sub>	_	2154	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>	Exhibit 1	13-8	
- F(	0	2101	Extribit 10 0					Exhibit	13-	
						V <sub>R</sub>		10		
low Er	ntering		fluence A	rea		Flow En	tering I	Diverge Influ		a
		Actual	Max	Desirable	Violation?		Actu	al Max D	esirable	Violation?
$V_{R1}$		1444	Exhibit 13-8	4600:AII	No	V <sub>12</sub>		Exhibit 13-	8	
evel o	f Servi	ce Detern	nination (i	f not F)		Level of	Servic	e Determinat	ion (if no	t F)
D <sub>R</sub> =	5.475 +	0.00734 v <sub>R</sub> + 0	0.0078 V <sub>12</sub> - 0.0	00627 L <sub>A</sub>	· · · · · · · · · · · · · · · · · · ·		$D_{R} = 4.25$	52 + 0.0086 V <sub>12</sub> -	0.009 L <sub>D</sub>	
R = 1	3 = 15.3 (pc/mi/ln)					D <sub>R</sub> = (p	c/mi/ln)		_	
	(Exhibit 1					1	Exhibit 13	-2)		
	peed Determination					Speed L				
-										
•	.320 (Exit						xhibit 13-1	,		
R= 5	0.8 mph (	Exhibit 13-11)				l ''	ph (Exhibit			
S <sub>0</sub> = 5	4.2 mph (	Exhibit 13-11)				$S_0 = m$	ph (Exhibit	13-12)		
	1.9 mph (	Exhibit 13-13)				S = m	ph (Exhibit	13-13)		
	pht © 2012 University of Florida, All Rights Reserved					HCS2010 <sup>TM</sup>				12/9/2014 11

		RAI	MPS AND	RAMP JUN	CTIONS W	ORKSHE	ET			
General	Inforn	nation			Site Infor	mation				
Analyst		AJR		Fr	eeway/Dir of Tr		Cosgrove NB			
Agency or Co	ompany	Atkins	S		nction		7030 - NB On fr	om I-26 WB		
Date Perforn		7/25/2	2014	Ju	risdiction					
Analysis Tim	e Period	PM P		Ar	nalysis Year		2018 Build - Riv	er Center Site		
Project Desc	ription N	lavy Base ICT	F							
nputs										
Jpstream Ad	di Ramn		Freeway Num	ber of Lanes, N	3				Downstre	am Adi
potroum	aj i turrip		Ramp Number	r of Lanes, N	1				Ramp	ann 7 taj
🗌 Yes	On		1	ane Length, L	200					
			1	ane Length L <sub>D</sub>	200				Yes	∐ On
☑ No			1	- 5					✓ No	Off
			Freeway Volui		866				l -	ft
- <sub>up</sub> =	ft		Ramp Volume		353				L <sub>down</sub> =	IL
/ -	veh/h		Freeway Free-	-Flow Speed, S <sub>FF</sub>	55.0				V <sub>D</sub> =	veh/h
/ <sub>u</sub> =	ven/n		Ramp Free-Flo	ow Speed, S <sub>FR</sub>	45.0				, D	VC11/11
Convers	sion to	pc/h Und	der Base (	Conditions						
		V	PHF		%Truck	%Rv	f	f	V - V/DH	F x f <sub>HV</sub> x f <sub>p</sub>
(pc/h	')	(Veh/hr)	РПГ	Terrain	% ITUCK	70 KV	f <sub>HV</sub>	f <sub>p</sub>	V - V/F11	^ 'HV ^ 'p
Freeway		866	0.90	Level	7	0	0.966	1.00		996
Ramp		353	0.90	Level	10	0	0.952	1.00		412
UpStream										
DownStream	n									
:			Merge Areas			=		Diverge Areas		
Stimati	on or	V <sub>12</sub>				Estimati	on of v <sub>12</sub>			
		$V_{12} = V_{F}$	(P <sub>FM</sub> )				V	= V <sub>R</sub> + (V <sub>F</sub> - V <sub>R</sub>	\P	
<sub>-EQ</sub> = (Equation 13-6 or 13-7)					_	* 12			12)	
P <sub>FM</sub> = 0.583 using Equation (Exhibit 13-6)				L <sub>EQ</sub> =		(Equation 13-				
/ <sub>12</sub> =		581 p		(EXIIIDIC 10 0)		P <sub>FD</sub> =		using Equation	n (Exhibit 1	3-7)
				n 13-14 or 13-		V <sub>12</sub> =		pc/h		
$V_3$ or $V_{av34}$		415 pt	c/ii (⊏quatioi	11 13-14 01 13-		$\rm V_3$ or $\rm V_{av34}$		pc/h (Equation 1	13-14 or 13-	17)
ls V <sub>2</sub> or V <sub>2,2</sub>	, > 2.700	pc/h? Yes	s 🗸 No			Is V <sub>3</sub> or V <sub>av3</sub>	<sub>4</sub> > 2,700 pc/h?	☐Yes ☐No		
		V <sub>12</sub> /2 ☐ Yes				Is V <sub>3</sub> or V <sub>av3</sub>	4 > 1.5 * V <sub>12</sub> /2	□Yes □No		
				s-16, 13-18, or		If Yes,V <sub>12a</sub> =		pc/h (Equatio	n 13-16, 1	3-18, or
Yes,V <sub>12a</sub> =		13-19)		-10, 10-10, 01		11 165, v <sub>12a</sub> –		13-19)		
Capacity	y Chec	ks				Capacity	Checks			
		Actual	С	apacity	LOS F?		Actua	ıl Car	pacity	LOS F?
						V <sub>F</sub>		Exhibit 13-	8	
	1	4.400	E 1 11 11 40 0			V <sub>FO</sub> = V <sub>F</sub>	- V <sub>2</sub>	Exhibit 13-	8	
$V_{FC}$		1408	Exhibit 13-8		No		· R	Exhibit 13		+
	1					$V_R$		10		
low En	terina	Merae In	fluence A	rea		Flow En	terina Div	erge Influen	ce Area	)
		Actual		Desirable	Violation?		Actual	Max Desi		Violation?
V <sub>R12</sub>	,	993	Exhibit 13-8	4600:AII	No	V <sub>12</sub>		Exhibit 13-8		
		ce Detern	nination (i				Service D	eterminatio	n (if not	F)
			0.0078 V <sub>12</sub> - 0.0					0.0086 V <sub>12</sub> - 0	•	,
			7.3070 v <sub>12</sub> = 0.0	,002, LA		L		0.0000 V <sub>12</sub> ° 0.	.000 LD	
) <sub>R</sub> = 11						D <sub>R</sub> = (pc/mi/ln)				
	(Exhibit 1					`	xhibit 13-2)			
	Speed Determination					Speed D	eterminat	ion		
	<u> eterm</u>	111411011								
Speed D						$D_s = (E)$	khibit 13-12)			
Speed D	314 (Exibi	t 13-11)				, ,	,	2)		
Speed $D_{\rm N_S} = 0.3$ $S_{\rm R} = 50$	314 (Exibi ).9 mph (E	t 13-11) Exhibit 13-11)				S <sub>R</sub> = mp	h (Exhibit 13-1			
<b>Speed D</b> $M_{\rm S} = 0.3$ $S_{\rm R} = 50$ $S_{\rm O} = 55$	314 (Exibi ).9 mph (E 5.0 mph (E	t 13-11)				S <sub>R</sub> = mp S <sub>0</sub> = mp	,	2)		

		RAMP	S AND RAM	<u>IP JUNCTI</u>	<u>ONS WO</u>	RKS	<u>HEET</u>			
General Info	rmation			Site Infor	mation					
Analyst	AJR		Fr	reeway/Dir of Tr	avel	Cosgro	/e SB			
Agency or Company	y Atkin	ıs	Jı	unction		•	Off to I-26	WB		
Date Performed	7/25/	/2014	Jı	urisdiction						
Analysis Time Perio	d AM F	<sup>o</sup> eak	Aı	nalysis Year		2018 B	uild - Rive	Center Site		
Project Description	Navy Base IC	TF								
Inputs										
Literature of Author	3	Freeway Num	ber of Lanes, N	2					Dannatus	A al:
Upstream Adj F	Kamp	Ramp Numbe	•	1					Downstrea Ramp	am Auj
□Yes [	□On	1 '		'					ramp	
		1	ane Length, L <sub>A</sub>						☐Yes	On
✓ No	Off	Deceleration L	ane Length L <sub>D</sub>	225					✓ No	Off
		Freeway Volu	me, V <sub>F</sub>	1005						
L <sub>up</sub> =	ft	Ramp Volume	$, V_R$	161					L <sub>down</sub> =	ft
		Freeway Free	-Flow Speed, S <sub>FF</sub>	55.0						
V <sub>u</sub> = \	/eh/h	1	ow Speed, S <sub>ER</sub>	45.0					V <sub>D</sub> =	veh/h
		<u> </u>	111	45.0						
Conversion		ger Base (	conditions					,		
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		HV	f <sub>p</sub>	v = V/PHF	$x f_{HV} x f_{n}$
Frooway	<u> </u>	0.00	Lovel	5	0	_		1.00		r
Freeway	1005	0.90	Level		<u> </u>	_	976			45
Ramp	161	0.90	Level	20	0	0.9	909	1.00	19	97
UpStream Dawn Stream		++				+				
DownStream		Merge Areas						L Diverge Areas		
		Weige Aleas			Estimat	ion o		Diverge Areas		
Estimation of v <sub>12</sub>					LSumau	1011 0				
$V_{12} = V_F (P_{FM})$						V <sub>12</sub> =	· V <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>	P <sub>FD</sub>		
L <sub>EQ</sub> = (Equation 13-6 or 13-7)				L <sub>EQ</sub> =		(	Equation 13-1	2 or 13-13	)	
P <sub>FM</sub> =		Equation (E			P <sub>FD</sub> =			000 using Equ		
/ <sub>12</sub> =	pc/h	_4(-			V <sub>12</sub> =			145 pc/h	idiloii (Exili	DIC 10 17
	•	(F 40	44 - 40 47)						40.44	40.47)
/ <sub>3</sub> or V <sub>av34</sub>			-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>			pc/h (Equatio	n 13-14 or	13-17)
Is $V_3$ or $V_{av34} > 2.7$								☐Yes ☑ No		
Is $V_3$ or $V_{av34} > 1.5$					Is V <sub>3</sub> or V <sub>av3</sub>	<sub>34</sub> > 1.5		☐ Yes 🗹 No		
f Yes,V <sub>12a</sub> =			-16, 13-18, or		If Yes,V <sub>12a</sub> =	:		c/h (Equation	13-16, 13-	-18, or 13
	13-19	)			120			9)		
Capacity Ch	,				Capacit	y Che				
	Actual	C	apacity	LOS F?			Actual		pacity	LOS F
					$V_{F}$		1145	Exhibit 13-8	4500	No
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$	- V <sub>R</sub>	948	Exhibit 13-8	4500	No
10					V <sub>R</sub>	- 1	197	Exhibit 13-10	2100	No
F1		5, 1				<u> </u>				110
Flow Enterin	1			1 ) "   " 0	Flow En	_		rge Influen		1 10 10
	Actual		Desirable	Violation?			ctual	Max Desirab		Violation'
V <sub>R12</sub>		Exhibit 13-8			V <sub>12</sub>		145	Exhibit 13-8	4400:All	No
Level of Service Determination (if not F)					Level of	Serv	ice De	terminatio	n (if not	F)
<u>Level of Serv</u>	.00734 v <sub>R</sub> +	0.0078 V <sub>12</sub> -	0.00627 L <sub>A</sub>			$D_R = 4$	.252 + 0	.0086 V <sub>12</sub> - 0.0	009 L <sub>D</sub>	
D <sub>R</sub> = 5.475 + 0					L	2.1 (pc/			J	
$D_R = 5.475 + 0$	ገ)						,			
$D_{R} = 5.475 + 0$ $D_{R} = (pc/mi/li)$	•		· · · · · · · · · · · · · · · · · · ·				it 13-2)			
$D_R = 5.475 + 0$ $D_R = (pc/mi/li$ $D_R = (Exhibit)$	13-2)				Speed Determination					
$D_R = 5.475 + 0$ $D_R = (pc/mi/li$ $D_R = (Exhibit)$	13-2)									
$D_R = 5.475 + 0$ $D_R = (pc/mi/li)$ $D_R = (Exhibit)$ <b>Speed Deter</b>	13-2) <b>mination</b>				<del>  '                                   </del>		nination (hibit 13			
$D_R = 5.475 + 0$ $D_R = (pc/mi/li)$ $D_R =$	13-2) <b>mination</b> (3-11)				$D_{s} = 0.5$	316 (E		-12)		
$D_R = 5.475 + 0$ $D_R = (pc/mi/l)$ $D_R = (Exhibit)$	13-2) mination 13-11) hibit 13-11)				$D_s = 0.0$ $S_R = 50$	316 (E: ).9 mph	chibit 13 (Exhibit	-12) 13-12)		
$D_R = 5.475 + 0$ $D_R = (pc/mi/l)$ $D_R = (pc/$	13-2) <b>mination</b> (3-11)				$D_s = 0.3$ $S_R = 50$ $S_0 = N/$	316 (Ex ).9 mph /A mph	chibit 13	-12) 13-12) 13-12)		

		RAMP	S AND RAM	P JUNCTI	ONS WO	RKS	HEET					
General Info	rmation			Site Infor	mation							
Analyst	AJR		Fr	eeway/Dir of Tr	avel	Cosgro	ve SB					
Agency or Company	y Atkin	ıs	Ju	ınction		•	Off to I-26	WB				
Date Performed	7/25/	/2014	Ju	ırisdiction								
Analysis Time Perio	od PM F	Peak	Ar	nalysis Year		2018 B	uild - Rive	r Center Site				
Project Description	Navy Base IC	TF										
nputs												
Upstream Adj F	Ramp	1 1	ber of Lanes, N	2					Downstrea	am Adj		
	$\neg$	Ramp Number	r of Lanes, N	1					Ramp			
□Yes	On	1	ane Length, L <sub>A</sub>						☐Yes	On		
✓ No	Off	Freeway Volui	ane Length L <sub>D</sub>	225 1793					✓ No	Off		
L <sub>up</sub> =	ft	Ramp Volume		344					L <sub>down</sub> =	ft		
·		1	-Flow Speed, S <sub>FF</sub>	55.0					. ,			
$V_u = V_u$	/eh/h	1	ow Speed, S <sub>FR</sub>	45.0					V <sub>D</sub> =	veh/h		
Conversion	to pc/h Un		111									
(pc/h)	V			%Truck	%Rv		f <sub>HV</sub>	f <sub>p</sub>	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>		
Freeway	1793	0.90	Level	4	0	0.	980	1.00	20	)32		
Ramp	344	0.90	Level	8	0	_	962	1.00		98		
UpStream	<del>                                     </del>	<del>   </del>				<del>                                     </del>						
DownStream												
		Merge Areas		•				Diverge Areas				
Estimation of v <sub>12</sub>					Estimat	ion o	f v <sub>12</sub>					
$V_{12} = V_F (P_{FM})$								= V <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>	)P			
L <sub>EQ</sub> = (Equation 13-6 or 13-7)				L <sub>EQ</sub> =			Equation 13-1					
P <sub>FM</sub> =	using	Equation (E	exhibit 13-6)		P <sub>FD</sub> =			.000 using Equ	uation (Exh	ibit 13-7)		
/ <sub>12</sub> =	pc/h				V <sub>12</sub> =		2	032 pc/h				
/ <sub>3</sub> or V <sub>av34</sub>	pc/h (	Equation 13-	-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>		0	pc/h (Equation	n 13-14 o	r 13-17)		
Is $V_3$ or $V_{av34} > 2,7$	00 pc/h?	s 🗌 No			Is V <sub>3</sub> or V <sub>av</sub>	<sub>34</sub> > 2,7	00 pc/h? [	☐ Yes ☑ No				
Is V <sub>3</sub> or V <sub>av34</sub> > 1.5								☐Yes ☑ No				
			-16, 13-18, or					c/h (Equation	13-16. 13	-18. or 13		
Yes,V <sub>12a</sub> =	13-19		,,		If Yes,V <sub>12a</sub> =	=		9)		,		
Capacity Ch	ecks				Capacit	y Ch	ecks					
	Actual	С	apacity	LOS F?			Actual	Ca	pacity	LOS F		
					V <sub>F</sub>		2032	Exhibit 13-8	4500	No		
$V_{FO}$		Exhibit 13-8			V <sub>FO</sub> = V <sub>F</sub>	V <sub>D</sub>	1634	Exhibit 13-8	4500	No		
FO						· K	398	Exhibit 13-1				
		<u> </u>			V <sub>R</sub>					No		
Flow Enterin	7	_		Violation?	Flow En	_		rge Influen  Max Desirab		Violation		
V	Actual	Exhibit 13-8	Desirable	Violations	V <sub>12</sub>	$\overline{}$	Actual 2032	Exhibit 13-8	4400:All	No		
V <sub>R12</sub>	<u> </u>		· · · · · · · ·		+							
_evel of Serv								termination		<u>F)</u>		
$D_R = 5.475 + 0.00734 \text{ v}_R + 0.0078 \text{ V}_{12} - 0.00627 \text{ L}_A$								0.0086 V <sub>12</sub> - 0.0	009 L <sub>D</sub>			
R = (pc/mi/ln)				l ''	9.7 (pc	,						
OS = (Exhibit 13-2)						<u> </u>	oit 13-2)					
	mination				Speed L	Deter	minatio	on				
	s = (Exibit 13-11)				$D_s = 0.$	334 (E	xhibit 13	-12)				
Speed Deter	3-11)											
Speed Determine Speed Determine Speed Determine Speed Determine Speed Sp					$S_R = 50$	0.7 mph	(Exhibit	13-12)				
Speed Determine $M_S = \text{(Exibit 1)}$ $S_R = \text{mph (Eximple 2)}$	hibit 13-11)					-	•	•				
Speed Determine $M_S = \text{(Exibit 1)}$ $S_R = \text{mph (Existing 1)}$ $S_0 = \text{mph (Existing 2)}$					$S_0 = N$	/A mph	(Exhibit (Exhibit (Exhibit	13-12)				

Navy Base ICTF

		F	REEWAY	WEAV	ING WOF	RKSHEE	Τ			
Genera	I Informati	on			Site Info	rmation				
Analyst Agency/Co Date Perfo Analysis Ti Project De	rmed	AJR Atkins 7/25/20 AM Pe			Freeway/Dir of Travel Cosgrove SB Weaving Segment Location 7050-I-26 WB On to I-26 EB 0 Analysis Year 2018 Build - River Center Site					
Inputs	, ,									
Weaving segment length, L <sub>S</sub> 475				45 mph	Freeway min Freeway max Terrain type		C-D Roadway Multilan Highway: 1! 2250 Leve			
Conve		1	1	li .		· _		T	1	
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	f <sub>HV</sub>	fp	v (pc/h)	
$V_{FF}$	439	0.90	9	0	1.5	1.2	0.957	1.00	510	
$V_{RF}$	373	0.90	21	0	1.5	1.2	0.905	1.00	458	
$V_{FR}$	405	0.90	9	0	1.5	1.2	0.957	1.00	470	
$V_{RR}$	0	0.90	0	0	1.5	1.2	1.000	1.00	0	
$V_{NW}$	510							V =	1438	
$V_{W}$	928									
VR	0.645									
Config	uration Cha	aracteris	tics		1					
Minimum r	maneuver lanes,	$N_{WL}$		2 lc	Minimum weaving lane changes, LC <sub>MIN</sub> 928					
1	e density, ID			0.2 int/mi	i Weaving lane changes, LC <sub>W</sub> 9					
	RF lane changes,	141		1 lc/pc	Non-weaving		0 lc/h			
Minimum I	R lane changes	, LC <sub>FR</sub>		1 lc/pc	Total lane ch	nanges, LC <sub>AL</sub>	L		982 lc/h	
Minimum I	RR lane changes	, LC <sub>RR</sub>		lc/pc	Non-weaving vehicle index, I <sub>NW</sub>					
Weavir	ng Segmen	t Speed,	Density, I	_evel of	Service,	and Cap	acity			
	egment flow rate			1438 pc/h 3559 veh/h	Manying compant aread C				0.401 36.3 mph	
_	Weaving segment capacity, c <sub>w</sub> 3559 veh/ Weaving segment v/c ratio 0.38				Average wearing and C				36.4 mph	
	egment density,	D	13	3.2 pc/mi/ln	Average non		36.0 mph			
Level of S	ervice, LOS			В	Maximum we	eaving length	ı, L <sub>max</sub>		9574 ff	
Notes										
a. Weaving Chapter 13,	segments longer t "Freeway Merge anes that exceed the	and Diverge Se	gments".	_		solated merge	and diverge are	eas using the	procedures of	

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Navy Base ICTF

			REEWAY	WEAV	1		T			
Genera	al Informati	on			Site Info	rmation				
		AJR Atkins 7/25/20 PM Pe			Freeway/Dir of Travel Weaving Segment Location Analysis Year  Cosgrove SB 7050-I-26 WB On to I-26 EB 2018 Build - River Center Sit					
Inputs	Scription Wavy D	ase ICTT								
Weaving configuration  Weaving number of lanes, N  Weaving segment length, L <sub>S</sub> 475				45 mph	Freeway min Freeway max Terrain type		C-D Roadway Multilane Highways 15 2250 Leve			
Conve		1	1	11.		I	<del></del>			
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	f <sub>HV</sub>	fp	v (pc/h)	
$V_{FF}$	1046	0.90	7	0	1.5	1.2	0.966	1.00	1203	
$V_{RF}$	833	0.90	8	0	1.5	1.2	0.962	1.00	963	
$V_{FR}$	403	0.90	7	0	1.5	1.2	0.966	1.00	463	
$V_{RR}$	0	0.90	0	0	1.5	1.2	1.000	1.00	0	
$V_{NW}$	1203							V =	2629	
$V_{W}$	1426									
VR	0.542									
Config	uration Cha	aracteris	tics		1					
Minimum ı	maneuver lanes,	N <sub>WL</sub>		2 lc	Minimum weaving lane changes, LC <sub>MIN</sub> 14					
1	ge density, ID			0.2 int/mi	Weaving lane changes, LC <sub>w</sub>					
	RF lane changes	141		1 lc/pc	Non-weaving		0 lc/h			
Minimum I	FR lane changes	, LC <sub>FR</sub>		1 lc/pc	Total lane ch	nanges, LC <sub>AL</sub>	L		1480 lc/h	
Minimum I	RR lane changes	, LC <sub>RR</sub>		lc/pc	Non-weaving vehicle index, I <sub>NW</sub> 1					
Weavir	ng Segmen	t Speed,	Density, I	_evel of	Service,	and Cap	oacity			
	segment flow rate segment capacity	•			1\A/i				0.554 32.5 mph	
	segment v/c ratio	••		0.594	Average weaving anodd C				34.3 mph	
	segment density,	D	27	7.0 pc/mi/ln	Average nor	n-weaving sp	eed, S <sub>NW</sub>		30.5 mph	
Level of S	ervice, LOS			С	Maximum weaving length, L <sub>MAX</sub> 8326				8326 ft	
Notes										
Chapter 13,	segments longer t , "Freeway Merge a nes that exceed the	and Diverge Se	egments".			solated merge	and diverge ar	eas using the	procedures of	

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### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2018 Build-River Center Site AM Peak Navy Base ICTF Freeway/Direction Junction Segment ID

Cosgrove SB From I-26 EB 7060

### Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	2	3	1
Free-Flow Speed, FFS (mph)	45	45	45
Volume, V (veh/h)	812	1,617	805
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	10%	10%	11%
%RVs, P <sub>R</sub>	0%	0%	0%

### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, f <sub>HV</sub>	0.95	0.95	0.95
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	474	629	944
Capacity Flow Rate, c (pc/h/ln)	2,100	2,100	2,100
v/c ratio	0.23	0.30	0.45
Density, D <sub>MD</sub> (pc/mi/ln)	8.3	11.0	16.5
LOS	А	В	В

### Formulas and Reference Material

$$f_{HV} =$$

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

HCM 2010, Equation 11-2

$$D_{MD} =$$

HCM 2010, Equation 13-26

## Ramp Roadways Max Service Flow Rates

i iow i ia	103
	Capacity
FFS (mi/h)	(pc/h/ln)
> 50	2,200
>40-50	2,100
>30-40	2,000
≥20-30	1,900
<20	1,800

Source: HCM 2010, Exhibit 13-10

#### Diverge LOS Thresholds

Bivorgo Loo Tilioonolao				
	Density			
LOS	(pc/mi/ln)			
Α	≤10			
В	>10-20			
С	>20-28			
D	>28-35			
Е	>35			
F	v/c > 1			

### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2018 Build-River Center Site PM Peak Navy Base ICTF Freeway/Direction Junction Segment ID Cosgrove SB From I-26 EB 7060

### Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	2	3	1
Free-Flow Speed, FFS (mph)	45	45	45
Volume, V (veh/h)	1,879	3,044	1,165
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, $P_T$	8%	8%	7%
%RVs, P <sub>R</sub>	0%	0%	0%

### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.96	0.96	0.97
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	1,086	1,173	1,340
Capacity Flow Rate, c (pc/h/ln)	2,100	2,100	2,100
v/c ratio	0.52	0.56	0.64
Density, D <sub>MD</sub> (pc/mi/ln)	19.0	20.5	23.5
LOS	В	C	С

### Formulas and Reference Material

$$f_{HV} = \frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)} \qquad \text{HCM 2010, Equation 11-3}$$
 
$$V_p = \frac{V}{PHF^*N^*f_{HV}^*f_{P}} \qquad \text{HCM 2010, Equation 11-2}$$
 
$$D_{MD} = \frac{0.0175^*v_f}{N} \qquad \text{HCM 2010, Equation 13-26}$$

#### Ramp Roadways Max Service Flow Rates

1 low hates				
	Capacity			
FFS (mi/h)	(pc/h/ln)			
> 50	2,200			
>40-50	2,100			
>30-40	2,000			
≥20-30	1,900			
<20	1,800			

Source: HCM 2010, Exhibit 13-10

#### Diverge LOS Thresholds

21101g0 20	
	Density
LOS	(pc/mi/ln)
Α	≤10
В	>10-20
С	>20-28
D	>28-35
Е	>35
F	v/c > 1

		RAMP:	S AND RAM	P JUNCTI	ons wo	RKS	HEET			
General Info	rmation			Site Infor	mation					
Analyst	AJR		Fr	eeway/Dir of Tr	avel	Montag	ue NB			
Agency or Company							Off to I-26	EB		
Date Performed	7/25/	/2014	Ju	risdiction						
Analysis Time Perio	od AM F	<sup>2</sup> eak	Ar	nalysis Year		2018 B	uild - Rive	Center Site		
Project Description	Navy Base IC	TF								
nputs										
Upstream Adj F	Damn	Freeway Num	ber of Lanes, N	2					Downstrea	m Adi
Opsileani Auj r	Vallip	Ramp Number	of Lanes N	1					Ramp	aiii Auj
□Yes □	On	1 '	ane Length, L <sub>Δ</sub>							_
		1		0=0					☐Yes	On
✓ No	Off	1	ane Length L <sub>D</sub>	350					✓ No	Off
		Freeway Volur	ne, V <sub>F</sub>	1678						
L <sub>up</sub> =	ft	Ramp Volume	, V <sub>R</sub>	537					L <sub>down</sub> =	ft
		Freeway Free-	Flow Speed, S <sub>FF</sub>	55.0					\/ -	vah/h
$V_u = V_u$	/eh/h	Ramp Free-Flo	ow Speed. S <sub>-5</sub>	45.0					V <sub>D</sub> =	veh/h
Conversion t	to nc/h lln		111							
			Jonanions			_				
(pc/h)	(Veh/hr)	PHF	Terrain	%Truck	%Rv		$f_{HV}$	f <sub>p</sub>	v = V/PHF	$x f_{HV} x f_{p}$
Freeway	1678	0.90	Level	9	0	0.	957	1.00	19	48
Ramp	537	0.90	Level	5	0		976	1.00		12
UpStream	+	+ ***		<u> </u>		+ *				· <u>-</u>
DownStream	<del>                                     </del>	1				$\top$				
		Merge Areas		•			I	Diverge Areas		
Estimation o	f V <sub>12</sub>				Estimation of v <sub>12</sub>					
		( D )						.\/ /\/ \/	\D	
$V_{12} = V_F (P_{FM})$				$V_{12} = V_R + (V_F - V_R)P_{FD}$ $L_{FO} =$ (Equation 13-12 or 13-13)						
EQ =		ation 13-6 or			L <sub>EQ</sub> =			-		
P <sub>FM</sub> =	using	Equation (E	exhibit 13-6)		P <sub>FD</sub> =		1.	000 using Equ	ıation (Exhi	bit 13-7)
/ <sub>12</sub> =	pc/h				V <sub>12</sub> =		19	948 pc/h		
$V_3$ or $V_{av34}$	pc/h (	(Equation 13-	-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>		0	pc/h (Equatio	n 13-14 or	13-17)
Is V <sub>3</sub> or V <sub>av34</sub> > 2,70	00 pc/h? □ Ye	s 🗆 No			Is V <sub>3</sub> or V <sub>av</sub>	34 > 2,7	00 pc/h? [	☐Yes ☑ No		
Is V <sub>3</sub> or V <sub>av34</sub> > 1.5								Yes ☑ No		
			-16, 13-18, or					c/h (Equation	13-16, 13-	-18. or 13
f Yes,V <sub>12a</sub> =	13-19		,,		If Yes,V <sub>12a</sub> =	•		9)		,
Capacity Che	ecks				Capacit	y Ch	ecks			
	Actual	C	apacity	LOS F?			Actual	Ca	pacity	LOS F
					V <sub>F</sub>		1948	Exhibit 13-8	1	No
$V_{FO}$		Exhibit 13-8		1	$V_{FO} = V_{F}$	- V-	1336	Exhibit 13-8	4500	No
*FO		Exhibit 15-0		1		*R				_
					V <sub>R</sub>		612	Exhibit 13-10		No
Flow Enterin	g Merge In	ifluence A	rea		Flow En	terin	g Dive	rge Influen		
	Actual		Desirable	Violation?		1	Actual	Max Desirab	le	Violation
V <sub>R12</sub>		Exhibit 13-8			V <sub>12</sub>	′	948	Exhibit 13-8	4400:All	No
Level of Serv	ice Deterr	nination (i	f not F)		Level of	Serv	rice De	termination	if not	F)
								.0086 V <sub>12</sub> - 0.0	•	•
$D_R = 5.475 + 0.00734 \text{ v}_R + 0.0078 \text{ V}_{12} - 0.00627 \text{ L}_A$ $D_R = (\text{pc/mi/ln})$				L		mi/ln)	12	U		
$J_{D} = I n C / m I / I r$							,			
					_	<u> </u>	oit 13-2)			
.OS = (Exhibit					Speed L					
	<u>mınatıon</u>				ID - ^	353 (F	xhibit 13	-12)		
OS = (Exhibit					$D_s = 0.$	UUU (L		,		
OS = (Exhibit) Speed Determine $M_S = (Exibit)$	13-11)				1	•	(Exhibit	*		
OS = (Exhibit Speed Determine) $M_S = (Exibit 1)$ $M_S = (Exibit 1)$ $M_S = (Exibit 1)$	13-11) hibit 13-11)				S <sub>R</sub> = 50	).4 mph	(Exhibit	13-12)		
OS = (Exhibit) $OS = (Exhibit)$ $OS =$	13-11)				$S_R = 50$ $S_0 = N_0$	).4 mph /A mph		13-12) 13-12)		

		RAMP	S AND RAM	P JUNCTI	ONS WO	RKS	HEET			
General Info	rmation			Site Infor	mation					
Analyst	AJR		Fr	eeway/Dir of Tr	avel	Montag	ue NB			
Agency or Company	y Atkin	ıs	Ju	unction			Off to I-26	EB		
Date Performed	7/25/	/2014	Ju	ırisdiction						
Analysis Time Perio	od PM F	Peak	ıA	nalysis Year		2018 B	uild - Rive	Center Site		
Project Description	Navy Base IC	TF								
Inputs										
Literature of Author	2	Freeway Num	ber of Lanes, N	2					Dannatus	A al:
Upstream Adj F	Ramp	Ramp Number		1					Downstrea Ramp	am Auj
□Yes [	□On	1 '		'					ιταπρ	
		1	ane Length, L <sub>A</sub>						Yes	On
✓ No	Off	Deceleration L	ane Length L <sub>D</sub>	350					✓ No	Off
		Freeway Volui	ne, V <sub>F</sub>	1920						
L <sub>up</sub> =	ft	Ramp Volume	, V <sub>R</sub>	582					L <sub>down</sub> =	ft
		Freeway Free	Flow Speed, S <sub>FF</sub>	55.0					. ,	
V <sub>u</sub> = \	/eh/h	1	ow Speed, S <sub>FR</sub>	45.0					$V_D =$	veh/h
			111	45.0						
Conversion		der Base (	Conditions							
(pc/h)	(\/oh/hr\	PHF	Terrain	%Truck	%Rv		$f_{HV}$	f <sub>p</sub>	v = V/PHF	x f <sub>HV</sub> x f <sub>n</sub>
Frooway	(Veh/hr) 1920	0.90	Loval	7	0	_	966	1.00		208
Freeway			Level		<del></del>	_				
Ramp	582	0.90	Level	4	0	0.	980	1.00	6	60
UpStream Dawn Stream		++				+				
DownStream		Merge Areas						L Diverge Areas		
Estimation o		Merge Areas			Estimat	iono		Diverge Areas		
-Stilliation o	1 12				LStilliat	1011 0	1 12			
	$V_{12} = V_{F}$	(P <sub>FM</sub> )					V <sub>12</sub> =	· V <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>	R)P <sub>FD</sub>	
- <sub>EQ</sub> =	(Equa	ation 13-6 or	13-7)		L <sub>EQ</sub> = (Equation 13-12 or 13-13)					
P <sub>FM</sub> =		Equation (E			P <sub>FD</sub> =			000 using Equ		
/ <sub>12</sub> =	pc/h	_4(-			V <sub>12</sub> =			208 pc/h	action (Exit	510 17
		(F	44 40 47)					•	10.11	40.47)
/ <sub>3</sub> or V <sub>av34</sub>			-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>			pc/h (Equatio	n 13-14 oi	13-17)
Is $V_3$ or $V_{av34} > 2.7$								☐Yes ☑ No		
Is $V_3$ or $V_{av34} > 1.5$					Is V <sub>3</sub> or V <sub>av</sub>	<sub>34</sub> > 1.5		☐ Yes 🗹 No		
f Yes,V <sub>12a</sub> =			-16, 13-18, or		If Yes,V <sub>12a</sub> =	=		c/h (Equation	13-16, 13	-18, or 13
	13-19	)						9)		
Capacity Ch	_	17			Capacit	y Ch				
	Actual	C	apacity	LOS F?			Actual		pacity	LOS F
					$V_{F}$		2208	Exhibit 13-8	4500	No
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$	- V <sub>R</sub>	1548	Exhibit 13-8	4500	No
10					V <sub>R</sub>	- 1	660	Exhibit 13-10		No
	<u> </u>									INO
Flow Enterin	1	_		1	Flow En	_		rge Influen		1
	Actual		Desirable	Violation?		$\overline{}$	Actual	Max Desirab		Violation
V <sub>R12</sub>		Exhibit 13-8			V <sub>12</sub>		2208	Exhibit 13-8	4400:All	No
Level of Serv	vice Deterr	mination (i	f not F)		Level of	f Serv	ice De	terminatio	n (if not	F)
$D_R = 5.475 + 0$						$D_{R} = 4$	.252 + 0	.0086 V <sub>12</sub> - 0.0	009 L <sub>D</sub>	
				L		/mi/ln)	12	U		
				I		,				
∩c = /⊏\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\						`	oit 13-2)			
	mination				Speed L	Deter	minatio	on		
					$D_s = 0.$	.357 (E	xhibit 13	-12)		
Speed Deter	13-11)		I i							
Speed Deter						0.4 mph	(Exhibit	13-12)		
Speed Determine $M_S = (Exibit 1 S_R = mph (Exibit 2 S_R = mph (E$	hibit 13-11)				S <sub>R</sub> = 50	-	(Exhibit	*		
Speed Determine $M_S = \text{(Exibit 1)}$ $S_R = \text{mph (Exibit 2)}$ $S_0 = \text{mph (Exibit 2)}$					$S_{R} = 50$ $S_{0} = N_{R}$	/A mph	(Exhibit (Exhibit (Exhibit	13-12)		

### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2018 Build-River Center Site AM Peak Navy Base ICTF Freeway/Direction Junction Segment ID Montague NB From I-26 EB 8020

### Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	2	3	1
Free-Flow Speed, FFS (mph)	45	45	25
Volume, V (veh/h)	1,141	1,598	457
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	9%	7%	5%
%RVs, P <sub>R</sub>	0%	0%	0%

### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.96	0.97	0.98
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	662	613	520
Capacity Flow Rate, c (pc/h/ln)	2,100	2,100	1,900
v/c ratio	0.32	0.29	0.27
Density, D <sub>MD</sub> (pc/mi/ln)	11.6	10.7	9.1
LOS	В	В	Α

### Formulas and Reference Material

$$f_{HV} =$$

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

HCM 2010, Equation 11-2

$$D_{MD} =$$

HCM 2010, Equation 13-26

## Ramp Roadways Max Service Flow Rates

Flow Rates				
	Capacity			
FFS (mi/h)	(pc/h/ln)			
> 50	2,200			
>40-50	2,100			
>30-40	2,000			
≥20-30	1,900			
<20	1,800			

Source: HCM 2010, Exhibit 13-10

#### Diverge LOS Thresholds

Divorge 200 Timeened				
	Density			
LOS	(pc/mi/ln)			
Α	≤10			
В	>10-20			
С	>20-28			
D	>28-35			
Е	>35			
F	v/c > 1			

### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2018 Build-River Center Site PM Peak Navy Base ICTF Freeway/Direction Junction Segment ID Montague NB From I-26 EB 8020

### Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	2	3	1
Free-Flow Speed, FFS (mph)	45	45	25
Volume, V (veh/h)	1,338	1,584	246
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	7%	5%	9%
%RVs, P <sub>R</sub>	0%	0%	0%

### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.97	0.98	0.96
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	769	601	286
Capacity Flow Rate, c (pc/h/ln)	2,100	2,100	1,900
v/c ratio	0.37	0.29	0.15
Density, D <sub>MD</sub> (pc/mi/ln)	13.5	10.5	5.0
LOS	В	В	А

### Formulas and Reference Material

$$f_{HV} =$$

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

HCM 2010, Equation 11-2

$$D_{MD} =$$

HCM 2010, Equation 13-26

## Ramp Roadways Max Service Flow Rates

1 low hates				
	Capacity			
FFS (mi/h)	(pc/h/ln)			
> 50	2,200			
>40-50	2,100			
>30-40	2,000			
≥20-30	1,900			
<20	1,800			

Source: HCM 2010, Exhibit 13-10

### Diverge LOS Thresholds

Bivorgo EOO Tilloonolao				
	Density			
LOS	(pc/mi/ln)			
Α	≤10			
В	>10-20			
С	>20-28			
D	>28-35			
Е	>35			
F	v/c > 1			

### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2018 Build-River Center Site AM Peak Navy Base ICTF Freeway/Direction Junction Segment ID

Montague SB Off to I-26 EB 8030

### Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	3	2	1
Free-Flow Speed, FFS (mph)	45	45	25
Volume, V (veh/h)	1,548	1,182	366
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	7%	9%	9%
%RVs, P <sub>R</sub>	0%	0%	0%

### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.97	0.96	0.96
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	593	686	425
Capacity Flow Rate, c (pc/h/ln)	2,100	2,100	1,900
v/c ratio	0.28	0.33	0.22
Density, D <sub>MD</sub> (pc/mi/ln)	10.4	12.0	7.4
LOS	В	В	Α

### Formulas and Reference Material

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

HCM 2010, Equation 11-2

$$D_{MD} =$$

HCM 2010, Equation 13-26

## Ramp Roadways Max Service Flow Rates

Flow Rates				
	Capacity			
FFS (mi/h)	(pc/h/ln)			
> 50	2,200			
>40-50	2,100			
>30-40	2,000			
≥20-30	1,900			
<20	1,800			

Source: HCM 2010, Exhibit 13-10

### Diverge LOS Thresholds

Birongo Eo o Timoonolao				
	Density			
LOS	(pc/mi/ln)			
Α	≤10			
В	>10-20			
С	>20-28			
D	>28-35			
Е	>35			
F	v/c > 1			

### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2018 Build-River Center Site PM Peak Navy Base ICTF Freeway/Direction Junction Segment ID

Montague SB Off to I-26 EB 8030

### Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	3	2	1
Free-Flow Speed, FFS (mph)	45	45	25
Volume, V (veh/h)	1,859	1,396	463
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, $P_T$	5%	7%	6%
%RVs, P <sub>R</sub>	0%	0%	0%

### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.98	0.97	0.97
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	706	803	530
Capacity Flow Rate, c (pc/h/ln)	2,100	2,100	1,900
v/c ratio	0.34	0.38	0.28
Density, D <sub>MD</sub> (pc/mi/ln)	12.4	14.1	9.3
LOS	В	В	А

### Formulas and Reference Material

$$f_{HV} =$$

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

HCM 2010, Equation 11-2

$$D_{MD} =$$

HCM 2010, Equation 13-26

## Ramp Roadways Max Service Flow Rates

1 low hates				
	Capacity			
FFS (mi/h)	(pc/h/ln)			
> 50	2,200			
>40-50	2,100			
>30-40	2,000			
≥20-30	1,900			
<20	1,800			

Source: HCM 2010, Exhibit 13-10

### Diverge LOS Thresholds

Birongo Eo o Timoonolao				
	Density			
LOS	(pc/mi/ln)			
Α	≤10			
В	>10-20			
С	>20-28			
D	>28-35			
Е	>35			
F	v/c > 1			

eneral				IVAINI 2014	CTIONS W	OKNOH	<u> </u>			
	<i>Inforn</i>	nation			Site Infor					
Analyst AJR Freeway/Dir o					eeway/Dir of Tr	· · · · · · · · · · · · · · · · · · ·				
gency or C		Atkin		Junction			8040 - On from I-26 EB			
ate Perforr		7/25/			risdiction					
nalysis Tim		AM F		Ar	nalysis Year		2018 Build - Rive	er Center Site		
oject Desc <b>1puts</b>	cription i	Navy Base ICT	F							
•			Freeway Num	ber of Lanes, N	2					
pstream A	dj Ramp		1						Downstre	eam Adj
Yes	On		Ramp Number		1				Ramp	
_ 103			1	ane Length, L <sub>A</sub>	550				□Yes	On
☑ No	Off		1	ane Length L <sub>D</sub>					✓No	Off
			Freeway Volur	ne, V <sub>F</sub>	1182				_	
<sub>ip</sub> =	ft		Ramp Volume	, V <sub>R</sub>	415				L <sub>down</sub> =	ft
_	1- //-		Freeway Free-	Flow Speed, S <sub>FF</sub>	55.0				V <sub>D</sub> =	veh/h
u =	veh/h		Ramp Free-Flo	ow Speed, S <sub>FR</sub>	45.0				V <sub>D</sub>	VCII/II
onver	sion to	pc/h Und	der Base (	Conditions						
(pc/h	1)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	f <sub>p</sub>	v = V/PH	F x f <sub>HV</sub> x f <sub>p</sub>
reeway		1182	0.90	Level	9	0	0.957	1.00		1372
lamp		415	0.90	Level	14	0	0.935	1.00		493
pStream		-								
ownStrea	m									
			Merge Areas					Diverge Areas		
stimat	ion of	v <sub>12</sub>				Estimation of v <sub>12</sub>				
		V <sub>12</sub> = V <sub>F</sub>	(P <sub>FM</sub> )				V <sub>12</sub> =	· V <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>	R)P <sub>FD</sub>	
<sub>EQ</sub> =		(Equa	ation 13-6 or	13-7)		L <sub>EQ</sub> =		(Equation 13	-12 or 13-	13)
-M =		1.000	using Equati	ion (Exhibit 13-6)		P <sub>FD</sub> =		using Equation	on (Exhibit 1	3-7)
12 =		1372		,		V <sub>12</sub> =		pc/h	,	,
or V <sub>av34</sub>				13-14 or 13-17)	ı	V <sub>3</sub> or V <sub>av34</sub>		pc/h (Equation	13-14 or 13-	17)
	م > 2.700	pc/h? Yes		,			, > 2.700 pc/h?	☐Yes ☐ No		,
		V <sub>12</sub> /2 □ Ye						☐ Yes ☐ No		
				-16, 13-18, or		1		pc/h (Equation		13-18. or
Yes,V <sub>12a</sub> =	=	13-19)		,,		If Yes,V <sub>12a</sub> =		13-19)	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	10 10, 01
apacit	y Chec	ks				Capacit	y Checks			
		Actual	C	apacity	LOS F?		Actua		pacity	LOS F?
						$V_{F}$		Exhibit 13-	-8	
V <sub>F</sub> (	,	1865	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>	Exhibit 13-	-8	
10						V <sub>R</sub>		Exhibit 13	3-	
								10		
iow En	tering		fluence A		Violation?	Flow En		erge Influer Max Des		
- \/		Actual 1865	Exhibit 13-8	Desirable 4600:All	No	\/	Actual	Exhibit 13-8	irable	Violation <sup>*</sup>
V <sub>R1</sub>					INO	V <sub>12</sub>	i Convice D	eterminatio	n /if no	<u> </u>
			nination (i					0.0086 V <sub>12</sub> - 0		( F)
			0.0078 V <sub>12</sub> - 0.0	10027 L <sub>A</sub>		1		0.0000 v <sub>12</sub> - 0	7.009 L <sub>D</sub>	
	6.3 (pc/mi/	•					oc/mi/ln)			
	(Exhibit 13	<u> </u>				_	Exhibit 13-2)			
peed [	Determ	ination				<del></del>	Determinati	ion		
M <sub>S</sub> = 0.297 (Exibit 13-11)					$D_s = $ (Exhibit 13-12)					
= 5′	1.1 mph (E	Exhibit 13-11)				S <sub>R</sub> = mph (Exhibit 13-12)				
	N/A mph (Exhibit 13-11)					S <sub>0</sub> = mph (Exhibit 13-12)				
	/A mph (E:	XIIIDIL 13-11)				- 0		,		
= N		Exhibit 13-11)				ľ	, ph (Exhibit 13-13			

	RAI	MPS AND	RAMP JUN	CTIONS W	ORKSH	EET			
General Info				Site Infor					
Analyst	AJR		Fı	reeway/Dir of Tr	ravel Montague SB				
Agency or Compa	ny Atkin	S	Jı	unction		8040 - On from	I-26 EB		
Date Performed	7/25/	2014		ırisdiction					
nalysis Time Per			A	nalysis Year		2018 Build - Riv	er Center Site		
	n Navy Base IC1	<u>rf</u>							
nputs		1						1	
Jpstream Adj Ran	пр	1 '	ber of Lanes, N	2				Downstre	eam Adj
<b>-</b>		Ramp Number	r of Lanes, N	1				Ramp	
Yes 0	On	Acceleration L	ane Length, L <sub>A</sub>	550				□Yes	On
✓ No 🔲 (	Off	Deceleration L	ane Length L <sub>D</sub>						_
3140	O11	Freeway Volu	me, V	1396				✓ No	Off
up = ft		Ramp Volume	1	249				L <sub>down</sub> =	ft
ap		1	Flow Speed, S <sub>FF</sub>	55.0					
$v_{\rm u}$ = veh	n/h	1						$V_D =$	veh/h
			ow Speed, S <sub>FR</sub>	45.0					
conversion	to pc/h Und	der Base (	Conditions	1	1		i		
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	$f_{HV}$	f <sub>p</sub>	v = V/PH	$F x f_{HV} x f_{p}$
reeway	1396	0.90	Level	7	0	0.966	1.00	+	1605
Ramp	249	0.90	Level	8	0	0.962	1.00		288
JpStream	240	0.50	LOVOI	-	<del>                                     </del>	0.302	1.00		200
DownStream					<del>                                     </del>	1			
		Merge Areas		•		•	Diverge Areas	•	
stimation	of v <sub>12</sub>				Estimation of v <sub>12</sub>				
	V <sub>12</sub> = V <sub>F</sub>	(P)			<del>                                     </del>		= V <sub>R</sub> + (V <sub>F</sub> - V <sub>I</sub>	)P	
=		ation 13-6 or	. 12 7)		-	* 12			12)
EQ =					L <sub>EQ</sub> = (Equation 13-12 or 13-13)				
) <sub>FM</sub> =			ion (Exhibit 13-6)	)	P <sub>FD</sub> = using Equation (Exhibit 13-7)				
' <sub>12</sub> =	1605	•			V <sub>12</sub> = pc/h				
$V_3$ or $V_{av34}$			13-14 or 13-17)	)	$V_3$ or $V_{av34}$		pc/h (Equation		17)
	,700 pc/h? Ye						☐ Yes ☐ No		
Is $V_3$ or $V_{av34} > 1$ .	.5 * V <sub>12</sub> /2				Is V <sub>3</sub> or V <sub>av</sub>	$_{34} > 1.5 * V_{12}/2$	☐Yes ☐ No		
Yes,V <sub>12a</sub> =			3-16, 13-18, or		If Yes,V <sub>12a</sub> :	=	pc/h (Equation	on 13-16, 1	13-18, or
	13-19)	)					13-19)		
Capacity Cl		T ^	.,	1 100 50	Capacii	y Checks		••	1 100 50
	Actual		apacity	LOS F?	\ \ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\	Actua		pacity	LOS F?
					V <sub>F</sub>		Exhibit 13	_	
$V_{FO}$	1893	Exhibit 13-8		No	$V_{FO} = V_{F}$	-V <sub>R</sub>	Exhibit 13	-8	
					V <sub>R</sub>		Exhibit 13	3-	
		<u> </u>					10		
low Enteri	ng Merge In			1 1/2 1 2 2	Flow Er		erge Influe		
	Actual		Desirable	Violation?	.,	Actual	Max Des	sirable T	Violation
V <sub>R12</sub>	1893	Exhibit 13-8	4600:All	No	V <sub>12</sub>		Exhibit 13-8		<u> </u>
	rvice Detern						eterminatio		t F)
$D_{R} = 5.475$	5 + 0.00734 v <sub>R</sub> + 0	0.0078 V <sub>12</sub> - 0.0	00627 L <sub>A</sub>			$D_R = 4.252 +$	0.0086 V <sub>12</sub> - 0	).009 L <sub>D</sub>	
) <sub>R</sub> = 16.7 (pc	c/mi/ln)				$D_R = (p$	oc/mi/ln)			
OS = B (Exhit	oit 13-2)				1	Exhibit 13-2)			
•	· · · · · · · · · · · · · · · · · · ·				_	Determinat	ion		
Speed Determination						Exhibit 13-12)			
M <sub>S</sub> = 0.297 (Exibit 13-11)					ľ	=	٥١		
	oh (Exhibit 13-11)				1 ''	ph (Exhibit 13-12	-		
	h (Exhibit 13-11)				S <sub>0</sub> = mph (Exhibit 13-12)				
5 = 51.1 mp	oh (Exhibit 13-13)				S = m	ph (Exhibit 13-13	3)		
pyright © 2012 Un	iversity of Florida, A	All Rights Reserv	red		HCS2010 <sup>TM</sup>	Version 6.41	(	Generated: 12	2/9/2014 11:4

### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2018 Build-River Center Site AM Peak Navy Base ICTF Freeway/Direction Junction Segment ID

PAR NB Merge from 26 EB & WB 9010

### Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	1	2	1
Free-Flow Speed, FFS (mph)	55	55	55
Volume, V (veh/h)	108	275	167
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	3%	3%	3%
%RVs, P <sub>R</sub>	0%	0%	0%

### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.99	0.99	0.99
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	122	155	188
Capacity Flow Rate, c (pc/h/ln)	2,200	2,200	2,200
v/c ratio	0.06	0.07	0.09
Density, D <sub>MD</sub> (pc/mi/ln)	2.1	2.7	3.3
LOS	Α	Α	Α

### Formulas and Reference Material

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

HCM 2010, Equation 11-2

$$D_{MD} =$$

HCM 2010, Equation 13-26

#### Ramp Roadways Max Service Flow Rates

1 low hates						
	Capacity					
FFS (mi/h)	(pc/h/ln)					
> 50	2,200					
>40-50	2,100					
>30-40	2,000					
≥20-30	1,900					
<20	1,800					

Source: HCM 2010, Exhibit 13-10

#### Diverge LOS Thresholds

21101g0 20	
	Density
LOS	(pc/mi/ln)
Α	≤10
В	>10-20
С	>20-28
D	>28-35
Е	>35
F	v/c > 1

### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2018 Build-River Center Site PM Peak Navy Base ICTF Freeway/Direction Junction Segment ID

PAR NB Merge from 26 EB & WB 9010

### Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	1	2	1
Free-Flow Speed, FFS (mph)	55	55	55
Volume, V (veh/h)	51	148	97
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	2%	2%	2%
%RVs, P <sub>R</sub>	0%	0%	0%

### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.99	0.99	0.99
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	57	83	109
Capacity Flow Rate, c (pc/h/ln)	2,200	2,200	2,200
v/c ratio	0.03	0.04	0.05
Density, D <sub>MD</sub> (pc/mi/ln)	1.0	1.5	1.9
LOS	Α	A	Α

### Formulas and Reference Material

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

HCM 2010, Equation 11-2

$$D_{MD} =$$

HCM 2010, Equation 13-26

## Ramp Roadways Max Service Flow Rates

1 low hates						
	Capacity					
FFS (mi/h)	(pc/h/ln)					
> 50	2,200					
>40-50	2,100					
>30-40	2,000					
≥20-30	1,900					
<20	1,800					

Source: HCM 2010, Exhibit 13-10

#### Diverge LOS Thresholds

21101g0 20	
	Density
LOS	(pc/mi/ln)
Α	≤10
В	>10-20
С	>20-28
D	>28-35
Е	>35
F	v/c > 1

General In	formation	13/31111	2 7 12 10	IP JUNCTI Site Infor							
Analyst	AJR	1	г.	reeway/Dir of Tr		DAD NII	2				
Analyst Agency or Comp				unction	ravel PAR NB 9020 - Off to Local Access Rd						
Date Performed	-	5/2014		urisdiction		3020 - 1	OII (O LOCA	II Access Nu			
analysis Time Pe		Peak		nalysis Year		2018 B	uild_River (	Center Site			
	on Navy Base IC		A	ilalysis i cai		2010 D	uliu-ixivei v	Jenier Oile			
nputs	on Navy Base to	· 11									
Upstream A	di Ramn	Freeway Num	per of Lanes, N	2					Downstre	am Adi	
Opsilealii A	luj Italiip	Ramp Number	of Lanes, N	1					Ramp	ani Auj	
□Yes	On	Acceleration L	ane Length, L <sub>A</sub>						Yes	On	
✓ No	Off	Deceleration L	ane Length L <sub>D</sub>	950					✓ No	Off	
		Freeway Volui	ne, V <sub>F</sub>	275							
L <sub>up</sub> =	ft	Ramp Volume	, V <sub>R</sub>	275					L <sub>down</sub> =	ft	
\/ <b>-</b>	!- /!-	Freeway Free	Flow Speed, S <sub>FF</sub>	55.0					V <sub>D</sub> =	veh/h	
$V_u =$	veh/h	Ramp Free-Fle	ow Speed, S <sub>FR</sub>	45.0					v <sub>D</sub> –	VCII/II	
Conversio	n to pc/h Un	der Base (	Conditions								
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	Т	f <sub>HV</sub>	f <sub>p</sub>	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>	
reeway	275	0.90	Level	3	0	0.9	985	1.00	3	10	
Ramp	275	0.90	Level	3	0	$\neg$	985	1.00	3	10	
JpStream											
DownStream											
- 42 - 42	-	Merge Areas			F 41 4			Diverge Areas			
stimation	of V <sub>12</sub>				Estimat	ion o	f v <sub>12</sub>				
	$V_{12} = V_{F}$	(P <sub>FM</sub> )					V <sub>12</sub> =	V <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>	R)P <sub>FD</sub>		
EQ =	(Equa	ation 13-6 or	13-7)		L <sub>EQ</sub> =		(1	Equation 13-1	2 or 13-13	3)	
= FM =	using	g Equation (E	xhibit 13-6)		P <sub>FD</sub> =		1.	000 using Equ	uation (Exh	ibit 13-7)	
12 =	pc/h	, ,	•		V <sub>12</sub> =			10 pc/h	,	,	
or V <sub>av34</sub>	•	(Equation 13-	14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>			pc/h (Equation	n 13 <sub>-</sub> 14 o	r 13 <sub>-</sub> 17)	
	2,700 pc/h?		110110117			> 2.7		Yes ☑ No	11 10 11 0	1 10 17)	
	1.5 * V <sub>12</sub> /2							Yes ✓ No			
0 0,01			-16, 13-18, or					oc/h (Equation	13-16 13	-18 or 13	
Yes,V <sub>12a</sub> =	13-19	: •	10, 10-10, 01		If Yes,V <sub>12a</sub> =	•		9)	10-10, 10	-10, 01 13	
Capacity C	hecks				Capacit	y Che	ecks				
	Actual	C	apacity	LOS F?			Actual	Ca	pacity	LOS F	
					V <sub>F</sub>		310	Exhibit 13-8	4500	No	
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$	- V <sub>R</sub>	0	Exhibit 13-8	4500	No	
10					V <sub>R</sub>	- 1	310	Exhibit 13-1	0 2100	No	
low Enter	ring Merge lı	nfluence A	roa			torin		rge Influen			
TOW LINES	Actual		Desirable	Violation?	7 10W E11	_	Actual	Max Desirab		Violation	
V <sub>R12</sub>		Exhibit 13-8			V <sub>12</sub>	$\overline{}$	310	Exhibit 13-8	4400:All	No	
	ervice Deteri		f not F)	<u> </u>	+			terminatio			
	+ 0.00734 v <sub>R</sub> +							.0086 V <sub>12</sub> - 0.	<u> </u>	1)	
		0.0070 V <sub>12</sub>	0.00027 LA					.0000 v <sub>12</sub> 0.	000 LD		
$_{R}$ = (pc/m					l ''	.6 (pc/	,				
`	bit 13-2)				_	•	oit 13-2)				
<u>'</u>	ermination				Speed $E$						
M <sub>S</sub> = (Exibit 13-11)						-	xhibit 13-				
						).8 mph	(Exhibit	13-12)			
= mph (	$S_0$ mph (Exhibit 13-11)										
	•				$S_0 = N$	/A mph	(Exhibit	13-12)			
<sub>0</sub> = mph (	•					-	(Exhibit )	· ·			

		RAMP:	S AND RAM	IP JUNCTI	ONS WO	RKS	HEET				
General Infor	rmation			Site Infor	mation						
Analyst	AJR		Fr	reeway/Dir of Tr	avel	PAR N	В				
Agency or Company	/ Atkin	ıs	Jı	unction		9020 -	Off to Loca	al Access Rd			
Date Performed	7/25/	/2014	Jı	urisdiction							
Analysis Time Perio	d PM F	Peak	Aı	nalysis Year		2018 B	uild-River	Center Site			
Project Description	Navy Base IC	TF									
Inputs											
Upstream Adj F	Ramp	1	ber of Lanes, N	2					Downstre	am Adj	
	7.0	Ramp Number	r of Lanes, N	1					Ramp		
□Yes	On	1	ane Length, L <sub>A</sub>						☐Yes	On	
✓ No	Off	Freeway Volui	ane Length L <sub>D</sub>	950 148					✓ No	Off	
L <sub>up</sub> =	ft	Ramp Volume		148					L <sub>down</sub> =	ft	
•		1	Flow Speed, S <sub>FF</sub>	55.0							
$V_u = V$	/eh/h	1	ow Speed, S <sub>FR</sub>	45.0					V <sub>D</sub> =	veh/h	
Conversion t	to pc/h Un		111								
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	Τ	f <sub>HV</sub>	f <sub>p</sub>	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>	
Freeway	148	0.90	Level	2	0	10	990	1.00	1	66	
Ramp	148	0.90	Level	2	0		990	1.00		66	
UpStream	110	0.00	20101	-	Ť	+ "		1.00			
DownStream	1					+					
		Merge Areas					1	Diverge Areas			
Estimation o					Estimati	ion o					
	V <sub>12</sub> = V <sub>F</sub>	/ D \						: V <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>	\D		
_			40.7)								
-EQ =		ation 13-6 or			L <sub>EQ</sub> =		,	Equation 13-1		•	
P <sub>FM</sub> =	using	Equation (E	Exhibit 13-6)		P <sub>FD</sub> =		1.	000 using Equ	ıation (Exh	ibit 13-7)	
/ <sub>12</sub> =	pc/h				V <sub>12</sub> =		16	66 pc/h			
$V_3$ or $V_{av34}$	pc/h (	Equation 13-	-14 or 13-17)		$V_3$ or $V_{av34}$		0	pc/h (Equatio	n 13-14 o	r 13-17)	
Is V <sub>3</sub> or V <sub>av34</sub> > 2,70	00 pc/h?	s 🗆 No			Is V <sub>3</sub> or V <sub>av3</sub>	2,7	00 pc/h? [	☐Yes ☑ No			
Is V <sub>3</sub> or V <sub>av34</sub> > 1.5								Yes ☑ No			
			-16, 13-18, or					oc/h (Equation	13-16, 13	-18. or 13	
f Yes,V <sub>12a</sub> =	13-19		.0, .0 .0, 0.		If Yes,V <sub>12a</sub> =			9)	,	.0, 00	
Capacity Che	ecks				Capacity	y Ch	ecks				
	Actual	С	apacity	LOS F?			Actual	Ca	pacity	LOS F	
					$V_{F}$		166	Exhibit 13-8	4500	No	
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$	- V <sub>D</sub>	0	Exhibit 13-8	4500	No	
, FO	1	Extraor 10 0				·R		Exhibit 13-10		_	
	14 /	<u> </u>			V <sub>R</sub>		166			No	
Flow Enterin	Actual	_	<b>rea</b> Desirable	Violation?	Flow En	_	<i>g Dive</i> Actual	rge Influend Max Desirab		Violation	
V	Actual	Exhibit 13-8	Desirable	Violations	V <sub>12</sub>	$\overline{}$	166	Exhibit 13-8	4400:All	No	
V <sub>R12</sub>	. 5 .		· · · · · · · ·		<del></del>						
Level of Serv								termination		<u>F)</u>	
$D_R = 5.475 + 0$	• • • • • • • • • • • • • • • • • • • •	0.0078 V <sub>12</sub> -	0.00627 L <sub>A</sub>			$D_{R} = 4$	.252 + 0	.0086 V <sub>12</sub> - 0.0	009 L <sub>D</sub>		
) <sub>R</sub> = (pc/mi/lr	*				I	.9 (pc/	,				
.OS = (Exhibit						`	oit 13-2)				
Speed Deteri	mination				Speed $D_s = 0.3$						
M <sub>S</sub> = (Exibit 13-11)						313 (E	xhibit 13	-12)			
S <sub>R</sub> = mph (Exhibit 13-11)						).9 mph	(Exhibit	13-12)			
							$S_R$ = 50.9 mph (Exhibit 13-12) $S_0$ = N/A mph (Exhibit 13-12)				
S <sub>R</sub> = mph (Ext	•				$S_0 = N/$	A mph	(Exhibit	13-12)			
$S_R = mph (Exh)$ $S_0 = mph (Exh)$	•				l *		(Exhibit (Exhibit	•			

		RAI	MPS AND	RAMP JUN	CTIONS W	ORKSHE	EET				
General li	nforn		•		Site Infor						
Analyst		AJR		Fr		PAR SB					
Agency or Com	icy or Company Atkins Junction						9030 - C	n from Loc	al Access Rd		
Date Performe	d	7/25/	2014	Ju	risdiction						
Analysis Time		AM P		Ar	nalysis Year		2018 Bu	ld-River Ce	enter Site		
	otion N	Navy Base ICT	F								
nputs			1								
Jpstream Adj F	Ramp		Freeway Numl	per of Lanes, N	2					Downstre	am Adj
	_		Ramp Number	of Lanes, N	1					Ramp	
Yes	On		Acceleration L	ane Length, L <sub>A</sub>	1000					□Yes	On
✓ No	Off		Deceleration L	ane Length L <sub>D</sub>							_
			Freeway Volur	ne, V	0					✓ No	Off
up =	ft		Ramp Volume		127					L <sub>down</sub> =	ft
up				Flow Speed, S <sub>FF</sub>	55.0						
/ <sub>u</sub> = \	veh/h		Ramp Free-Flo		45.0					$V_D =$	veh/h
2	4-			110	45.0						
onversio	on to	∨ pc/n Und		Conditions	Ì	1	1				
(pc/h)		(Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>l</sub>	HV	f <sub>p</sub>	v = V/PHI	$F \times f_{HV} \times f_{p}$
Freeway		0	0.90	Level	0	0	1.0	00	1.00		0
Ramp		127	0.90	Level	3	0	0.9	35	1.00		143
JpStream .											
DownStream											
		l	Merge Areas					Div	verge Areas		
stimatio	n of	v <sub>12</sub>				Estimati	on of	V <sub>12</sub>			
		V <sub>12</sub> = V <sub>F</sub>	(P <sub>FM</sub> )					V <sub>12</sub> = V <sub>1</sub>	R + (V <sub>F</sub> - V <sub>R</sub> )	)P <sub>FD</sub>	
. <sub>EQ</sub> =		(Equa	ation 13-6 or	13-7)		L <sub>EQ</sub> = (Equation 13-12 or 13-13)					
P <sub>FM</sub> =				on (Exhibit 13-6)		P <sub>FD</sub> = using Equation (Exhibit 13-7)					
' <sub>12</sub> =		0 pc/l		( ,		$V_{12} = pc/h$					
<sub>3</sub> or V <sub>av34</sub>		•		13-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub> pc/h (Equation 13-14 or 13-17)					
	> 2 700	pc/h? Yes		10-14-01-10-17)		Is $V_3$ or $V_{av34} > 2,700$ pc/h? $\square$ Yes $\square$ No					
		V <sub>12</sub> /2				Is $V_3$ or $V_{av34} > 1.5 * V_{12}/2$ Yes $\square$ No					
	- 1.5			-16, 13-18, or		1			res ∟ No c/h (Equation	13_16 1	3_18 or
Yes,V <sub>12a</sub> =		13-19)		10, 10-10, 01		If Yes,V <sub>12a</sub> =		13-		1 13-10, 1	J-10, OI
Capacity	Chec	ks				Capacity	y Che	cks	,		
		Actual	С	apacity	LOS F?			Actual	Сар	acity	LOS F?
						V <sub>F</sub>			Exhibit 13-8	3	
$V_{FO}$		143	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>D</sub>		Exhibit 13-8	3	
*FO		140	EXHIBIT 13-0		INO		IX		Exhibit 13-		
						V <sub>R</sub>			10		
low Ente	ering	Merge In	fluence A	rea		Flow En	tering	Diverg	ge Influen	ce Area	1
		Actual	Max [	Desirable	Violation?		Ad	tual	Max Desi	rable	Violation?
$V_{R12}$		143	Exhibit 13-8	4600:All	No	V <sub>12</sub>			Exhibit 13-8		
evel of S	Servi	ce Detern	nination (i	f not F)		Level of	Serv	ce Dete	erminatio	n (if not	F)
D <sub>R</sub> = 5.	.475 + 0	.00734 v <sub>R</sub> + 0	0.0078 V <sub>12</sub> - 0.0	0627 L <sub>A</sub>			$D_{R} = 4.1$	252 + 0.0	086 V <sub>12</sub> - 0.	009 L <sub>D</sub>	
• • •	(pc/mi/lr	• • •				L	c/mi/ln			_	
	xhibit 1					1	xhibit 1				
`		•				Speed D			2		
Speed Determination					<del>  '                                   </del>			1			
M <sub>S</sub> = 0.235 (Exibit 13-11)						1 "	xhibit 13				
		Exhibit 13-11)				1		oit 13-12)			
		xhibit 13-11)				I *		oit 13-12)			
5= 51.9	mph (E	Exhibit 13-13)				S = mp	oh (Exhib	oit 13-13)			
pyright © 2012	2 Univers	sity of Florida, A	II Rights Reserv	ed		HCS2010 <sup>™</sup>	Version	6.41	Ge	enerated: 12	/9/2014 11:47

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					9030 - 0	I IIOIII LOG	al Access Nu		
					2018 Bui	d Divor Co	ntor Sito		
		Al	iaiysis i cai		20 10 Bui	u-River Ce	THE SHE		
ry Dase IC I									
	Eroowov Numi	har of Lanca N	2						
	1 '							Downstre	am Adj
	1 '	•	1					Ramp	
	Acceleration L	ane Length, L <sub>A</sub>	1000					□Yes	On
	Deceleration L	ane Length L <sub>D</sub>							
	Freeway Volur	ne, V	0					M No	Off
	1							L <sub>down</sub> =	ft
	1	11							
	1							V <sub>D</sub> =	veh/h
		111	45.0						
c/h Und	der Base (	Conditions						,	
() (a la (la s)	PHF	Terrain	%Truck	%Rv	f.	<sub>IV</sub>	f	v = V/PHI	F x f <sub>u\/</sub> x f <sub>x</sub>
,					+				•
	<del>                                     </del>				_				0
291	0.90	Level	2	0	0.99	0	1.00		327
	++				+				
	Marga Arasa					Div	araa Araaa		
	Merge Areas			Estimati	ion of	V DIV	erge Areas		
				LSuman	011 01				
$V_{12} = V_{F}$	(P <sub>FM</sub> )								
(Equa	ation 13-6 or	13-7)		L <sub>EQ</sub> = (Equation 13-12 or 13-13)					
1.000	using Equati	ion (Exhibit 13-6)							
							,	,	
		12 14 or 12 17)						2 14 or 12 f	17\
		13-14 01 13-17)							
				Is V <sub>3</sub> or V <sub>av3</sub>	<sub>34</sub> > 1.5 *				
		-16, 13-18, or		If Yes,V <sub>12a</sub> =			\ I	n 13-16, 1	3-18, or
	1						19)		
		anacity	1 OS E2	Capacity	Circ		Car	nacity	LOS F?
Actual	1	арасну	LOST	\/		Actual	<del></del>		LOST
				<u> </u>	<del>,  </del>			_	
327	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>				
				V				-	
	<u></u>					5.			
			1 15 1 5 0	Flow En					,
Actual	<del>                                     </del>	Desirable	Violation?		Ac	tual	Max Desi	irabie I	Violation
00=		4600:AII	No	V <sub>12</sub>			Exhibit 13-8		
327	Exhibit 13-8				Sanvi	ce Dete	erminatio	n (if not	( <b>F</b> )
Detern	nination (i								- /
Detern						252 + 0.0	086 V <sub>12</sub> - 0.		
Detern	nination (i			ı	O <sub>R</sub> = 4.2		086 V <sub>12</sub> - 0.		, - ,
<b>Detern</b> 0734 v <sub>R</sub> + 0	nination (i			D <sub>R</sub> = (p	O <sub>R</sub> = 4.2 c/mi/ln)		086 V <sub>12</sub> - 0.		, - ,
<b>Detern</b> 0734 v <sub>R</sub> + (	nination (i			I D <sub>R</sub> = (p LOS = (E	O <sub>R</sub> = 4.2 c/mi/ln) Exhibit 1	3-2)			
Potern 1734 v <sub>R</sub> + ( 2) 12) 14)	nination (i			D <sub>R</sub> = (p   LOS = (E   <b>Speed D</b>	O <sub>R</sub> = 4.2 c/mi/ln) Exhibit 1 <b>Determ</b>	3-2) ination			
2) nation 3-11)	nination (i			D <sub>R</sub> = (p LOS = (E <b>Speed D</b> D <sub>s</sub> = (E	D <sub>R</sub> = 4.2 c/mi/ln) exhibit 1 <b>Determ</b> xhibit 13-	3-2) <b>ination</b> 12)			
Potern 1734 v <sub>R</sub> + ( 2) 12) 14)	nination (i			D <sub>R</sub> = (p LOS = (E <b>Speed D</b> D <sub>s</sub> = (E	O <sub>R</sub> = 4.2 c/mi/ln) Exhibit 1 <b>Determ</b>	3-2) <b>ination</b> 12)			
2) nation 3-11)	nination (i			$\begin{array}{ccc} & & & \text{I} \\ \text{D}_{\text{R}} = & & \text{(p} \\ \text{LOS} = & & \text{(E} \\ \textbf{Speed L} \\ \textbf{D}_{\text{S}} = & & \text{(E} \\ \textbf{S}_{\text{R}} = & & \text{m} \\ \end{array}$	D <sub>R</sub> = 4.2 c/mi/ln) exhibit 1 <b>Determ</b> xhibit 13-	3-2) <b>nination</b> 12) it 13-12)			
	7/25/ PM F vy Base ICT  vy Base ICT  vy Base ICT  vy Control v (Veh/hr) 0 291  122  V12 = VF (Equal 1.000 0 pc/l 0 pc/l 0 pc/h 13-19)  s Actual	AJR Atkins 7/25/2014 PM Peak  Vy Base ICTF  Freeway Numl Ramp Number Acceleration L Deceleration L Freeway Volun Ramp Volume Freeway Free- Ramp Free-File  Oc/h Under Base ( V (Veh/hr) PHF 0 0.90 291 0.90  Merge Areas  12  V12 = VF (PM) (Equation 13-6 or 1.000 using Equation 0 pc/h 0 pc/h (Equation 13-6 or 1.000 using Equation 0 pc/h (Equation 13-6 or 1.000 using Equation 13-19)  SActual C  327 Exhibit 13-8	AJR Atkins 7/25/2014 PM Peak  Ar  Ary Base ICTF  Freeway Number of Lanes, N Ramp Number of Lanes, N Ramp Number of Lanes, N Acceleration Lane Length, L Deceleration Lane Length L Freeway Volume, V Ramp Volume, V Remp Free-Flow Speed, S Ramp Free	AJR Atkins Atkins Junction 7/25/2014 PM Peak Analysis Year  Analysis Analysis  Analysis	AJR	AJR	AJR	AJR	AJR

### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2018 Build-River Center Site AM Peak Navy Base ICTF Freeway/Direction Junction Segment ID

PAR SB Split to 26 EB & WB 9040

### Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	2	1	1
Free-Flow Speed, FFS (mph)	55	55	55
Volume, V (veh/h)	127	95	32
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	3%	3%	3%
%RVs, P <sub>R</sub>	0%	0%	0%

### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.99	0.99	0.99
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	72	107	36
Capacity Flow Rate, c (pc/h/ln)	2,200	2,200	2,200
v/c ratio	0.03	0.05	0.02
Density, D <sub>MD</sub> (pc/mi/ln)	1.3	1.9	0.6
LOS	Α	Α	А

### Formulas and Reference Material

$$f_{HV} =$$

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

HCM 2010, Equation 11-2

$$D_{MD} =$$

HCM 2010, Equation 13-26

## Ramp Roadways Max Service Flow Rates

1 IOW Hales				
	Capacity			
FFS (mi/h)	(pc/h/ln)			
> 50	2,200			
>40-50	2,100			
>30-40	2,000			
≥20-30	1,900			
<20	1,800			

Source: HCM 2010, Exhibit 13-10

#### Diverge LOS Thresholds

ziroigo zoo iiiioonoido				
	Density			
LOS	(pc/mi/ln)			
Α	≤10			
В	>10-20			
С	>20-28			
D	>28-35			
Е	>35			
F	v/c > 1			

### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2018 Build-River Center Site PM Peak Navy Base ICTF Freeway/Direction Junction Segment ID PAR SB Split to 26 EB & WB 9040

### Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	2	1	1
Free-Flow Speed, FFS (mph)	55	55	55
Volume, V (veh/h)	291	203	88
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	2%	2%	2%
%RVs, P <sub>R</sub>	0%	0%	0%

### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.99	0.99	0.99
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	163	228	99
Capacity Flow Rate, c (pc/h/ln)	2,200	2,200	2,200
v/c ratio	0.07	0.10	0.05
Density, D <sub>MD</sub> (pc/mi/ln)	2.9	4.0	1.7
LOS	Α	A	А

### Formulas and Reference Material

$$f_{HV} =$$

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

HCM 2010, Equation 11-2

$$D_{MD} =$$

HCM 2010, Equation 13-26

## Ramp Roadways Max Service Flow Rates

1 IOW Hates				
	Capacity			
FFS (mi/h)	(pc/h/ln)			
> 50	2,200			
>40-50	2,100			
>30-40	2,000			
≥20-30	1,900			
<20	1,800			

Source: HCM 2010, Exhibit 13-10

#### Diverge LOS Thresholds

ziroigo zoo iiiioonoido				
	Density			
LOS	(pc/mi/ln)			
Α	≤10			
В	>10-20			
С	>20-28			
D	>28-35			
Е	>35			
F	v/c > 1			

	Arterial	Flow	Running	Signal	Travel	Dist	Arterial	Arterial
Cross Street	Class	Speed	Time	Delay	Time (s)	(mi)	Speed	LOS
Driveway	II	40	28.5	9.9	38.4	0.26	24.3	С
Carolina Ave	II	35	43.3	5.0	48.3	0.41	30.8	В
Reynolds Ave	II	35	44.7	9.2	53.9	0.43	28.7	В
ICTF Truck Dwy	II	40	30.5	17.7	48.2	0.30	22.4	С
McMillan Ave	II	40	15.4	12.1	27.5	0.13	17.5	D
Total	II		162.4	53.9	216.3	1.53	25.5	C

	Arterial	Flow	Running	Signal	Travel	Dist	Arterial	Arterial
Cross Street	Class	Speed	Time	Delay	Time (s)	(mi)	Speed	LOS
Cosgrove Ave	II	40	15.4	26.4	41.8	0.13	11.5	F
Reynolds Ave		40	30.5	19.0	49.5	0.30	21.8	D
Carolina Ave		35	44.7	6.8	51.5	0.43	30.0	В
Burton Ln		40	39.6	13.2	52.8	0.41	28.1	В
Stromboli Ave		40	28.5	11.9	40.4	0.26	23.1	С
Total	II		158.7	77.3	236.0	1.53	23.4	С

	Artorial	Flow	Dunning	Cianal	Travel	Diet	Artorial	Artorial
	Arterial	Flow	Running	Signal		Dist	Arterial	Arterial
Cross Street	Class	Speed	Time	Delay	Time (s)	(mi)	Speed	LOS
Driveway	II	40	28.5	12.5	41.0	0.26	22.7	С
Carolina Ave	II	35	43.3	7.4	50.7	0.41	29.3	В
Reynolds Ave	II	35	44.7	17.3	62.0	0.43	24.9	С
ICTF Truck Dwy	II	40	30.5	28.1	58.6	0.30	18.4	D
McMillan Ave	II	40	15.4	16.7	32.1	0.13	15.0	Е
Total			162.4	82.0	244.4	1.53	22.6	С

	Arterial	Flow	Running	Signal	Travel	Dist	Arterial	Arterial
Cross Street	Class	Speed	Time	Delay	Time (s)	(mi)	Speed	LOS
Cosgrove Ave	II	40	15.4	18.7	34.1	0.13	14.1	Е
Reynolds Ave		40	30.5	10.3	40.8	0.30	26.4	С
Carolina Ave		35	44.7	5.1	49.8	0.43	31.1	В
Burton Ln		40	39.6	10.1	49.7	0.41	29.9	В
Stromboli Ave		40	28.5	14.3	42.8	0.26	21.8	D
Total	II		158.7	58.5	217.2	1.53	25.4	С

	Arterial	Flow	Running	Signal	Travel	Dist	Arterial	Arterial
Cross Street	Class	Speed	Time	Delay	Time (s)	(mi)	Speed	LOS
Burton Ln	III	34	35.4	6.6	42.0	0.29	25.3	В
Reynolds Ave	III	35	50.6	9.4	60.0	0.42	25.3	В
Cosgrove Ave	III	35	27.9	18.5	46.4	0.23	18.0	С
Dorchester Rd	III	35	18.7	3.4	22.1	0.15	23.8	С
McMillan Ave	III	35	24.5	14.5	39.0	0.20	18.8	С
Total	III		157.1	52.4	209.5	1.30	22.3	C

	Arterial	Flow	Running	Signal	Travel	Dist	Arterial	Arterial
Cross Street	Class	Speed	Time	Delay	Time (s)	(mi)	Speed	LOS
Dorchester Rd	II	35	25.5	5.3	30.8	0.20	23.9	С
Cosgrove Ave	II	35	18.3	26.0	44.3	0.15	11.9	F
Reynolds Ave	II	35	27.6	3.3	30.9	0.23	27.1	С
Burton Ln	II	35	44.6	7.2	51.8	0.43	29.8	В
Stromboli Ave		37	32.4	2.3	34.7	0.29	30.6	В
Total	ll		148.4	44.1	192.5	1.31	24.4	С

	A . (		D	0:	T	D'. I	A . ( * . 1	A . ( ! . )
	Arterial	Flow	Running	Signal	Travel	Dist	Arterial	Arterial
Cross Street	Class	Speed	Time	Delay	Time (s)	(mi)	Speed	LOS
Burton Ln	III	34	35.4	9.8	45.2	0.29	23.5	С
Reynolds Ave	III	35	50.6	12.9	63.5	0.42	23.9	С
Cosgrove Ave	III	35	27.9	25.6	53.5	0.23	15.6	D
Dorchester Rd	III	35	18.7	3.2	21.9	0.15	24.0	В
McMillan Ave	III	35	24.5	20.4	44.9	0.20	16.4	D
Total	III		157.1	71.9	229.0	1.30	20.4	C

	Arterial	Flow	Running	Signal	Travel	Dist	Arterial	Arterial
Cross Street	Class	Speed	Time	Delay	Time (s)	(mi)	Speed	LOS
Dorchester Rd	II	35	25.5	4.6	30.1	0.20	24.4	С
Cosgrove Ave	II	35	18.3	42.0	60.3	0.15	8.7	F
Reynolds Ave		35	27.6	6.4	34.0	0.23	24.6	С
Burton Ln		35	44.6	9.3	53.9	0.43	28.6	В
Stromboli Ave		37	32.4	2.0	34.4	0.29	30.8	В
Total	ll		148.4	64.3	212.7	1.31	22.1	С

# Appendix E Traffic Analysis Worksheets

2038 Design Year

Build River Center Site Alternatives 5-7

# Appendix E Traffic Analysis Worksheets

2038 Design Year

Build River Center Site Alternatives 5-7

Interstate 26

		RAMP	S AND RAM	IP JUNCTI	ONS WO	RKS	HEET				
General Infor	mation			Site Infor							
Analyst	AJR		F	reeway/Dir of Tr		I-26 EB					
Agency or Company	Atkin	ns	J	unction		1010-EI	3 Off to C-	D			
Date Performed	7/25/	/2014	J	urisdiction							
Analysis Time Period			A	nalysis Year		2038 Bı	ıild - River	Center Site			
Project Description	Navy Base IC	TF									
Inputs											
Upstream Adj R	amp	1 1	ber of Lanes, N	4					Downstream	n Adj	
	70.	Ramp Numbe	•	1					Ramp		
∐Yes L	」On	Acceleration L	ane Length, L <sub>A</sub>						Yes	On	
✓ No	Off	Deceleration L	ane Length L <sub>D</sub>	400					✓ No	Off	
		Freeway Volu	me, V <sub>F</sub>	9101					INO INO		
L <sub>up</sub> = f	t	Ramp Volume	, V <sub>D</sub>	1010					L <sub>down</sub> =	ft	
·		1	-Flow Speed, S <sub>FF</sub>	60.0							
$V_u = V_v$	eh/h	1	ow Speed, S <sub>FR</sub>	55.0					$V_D = veh/h$		
Conversion to	o nc/h lln		111								
	∪ pc/ii oiii					$\overline{}$	. 1	_			
(pc/h)	(Veh/hr)	PHF	Terrain	%Truck	%Rv		HV	f <sub>p</sub>	v = V/PHF x	tt <sub>HV</sub> x t <sub>p</sub>	
Freeway	9101	0.90	Level	16	0	0.9	26	1.00	1092	<u>'</u> 1	
Ramp	1010	0.90	Level	5	0	0.9	76	1.00	1150	0	
UpStream											
DownStream											
Fatimatian at		Merge Areas			<b>F</b> -4i4i	:		iverge Areas			
Estimation of	12				Estimati	on o					
	$V_{12} = V_{F}$	(P <sub>FM</sub> )					V <sub>12</sub> =	$V_R + (V_F - V_F)$	R)P <sub>FD</sub>		
L <sub>EQ</sub> = (Equation 13-6 or 13-7)					L <sub>EQ</sub> =		(1	Equation 13-1	2 or 13-13)		
P <sub>FM</sub> =	using	Equation (E	Exhibit 13-6)		P <sub>FD</sub> =		0.4	436 using Equ	uation (Exhibi	t 13-7)	
V <sub>12</sub> =	pc/h		,		V <sub>12</sub> =		54	10 pc/h			
V <sub>3</sub> or V <sub>av34</sub>	•	Fouation 13	-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>			55 pc/h (Equa	ation 13-14	or 13-17)	
Is $V_3$ or $V_{av34} > 2,70$			,		Is V <sub>3</sub> or V <sub>av34</sub> > 2,700 pc/h? ✓ Yes ☐ No					,	
Is $V_3$ or $V_{av34} > 1.5$					Is $V_3$ or $V_{av34} > 1.5 * V_{12}/2$ Yes $\checkmark$ No						
			-16, 13-18, or		FF04 malla /Faccation 40 40 40 40					13-18	
If Yes,V <sub>12a</sub> =	13-19		10, 10 10, 01		If Yes,V <sub>12a</sub> =	:		· 13-19)	adon to to,	10 10,	
Capacity Che	cks				Capacity	y Che	cks				
	Actual	С	apacity	LOS F?			Actual	Ca	pacity	LOS F?	
					V <sub>F</sub>		10921	Exhibit 13-8	9200	Yes	
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$	- V <sub>D</sub>	9771	Exhibit 13-8	9200	Yes	
FO					V <sub>R</sub>	R	1150	Exhibit 13-10	+	No	
Flour Fretorin	<u> </u> 	-fluoroo A			-	40 11 10				INO	
Flow Entering	Actual	T .	<b>rea</b> Desirable	Violation?	FIOW EN		g <i>Divel</i> .ctual	rge Influen Max Desirab		Violation?	
	Actual	Exhibit 13-8	Jesirable	VIOIALIOIT?	V <sub>12</sub>	$\overline{}$	410	Exhibit 13-8	4400:All	Yes	
\/			· · · · · · · ·								
V <sub>R12</sub>	ica Dotorr	mination /	Level of Service Determination (if not F)				Level of Service Determination (if not F)				
Level of Serv					+	D - 4	$\Omega E \Omega + \Omega$	00061/ 0	000 I		
<b>Level of Serv</b> D <sub>R</sub> = 5.475 + 0.	00734 v <sub>R</sub> +				ı			.0086 V <sub>12</sub> - 0.	009 L <sub>D</sub>		
Level of Serv $D_R = 5.475 + 0.0$ $D_R = (pc/mi/ln)$	00734 v <sub>R</sub> +				D <sub>R</sub> = 48	3.1 (pc/	mi/ln)	.0086 V <sub>12</sub> - 0.0	009 L <sub>D</sub>		
Level of Serv $D_R = 5.475 + 0.0$ $D_R = (pc/mi/ln)$	00734 v <sub>R</sub> +				D <sub>R</sub> = 48	3.1 (pc/		.0086 V <sub>12</sub> - 0.1	009 L <sub>D</sub>		
Level of Serv $D_R = 5.475 + 0.0$ $D_R = (pc/mi/ln)$	00734 v <sub>R</sub> + ) 13-2)				D <sub>R</sub> = 48	3.1 (pc/ (Exhib	mi/ln) it 13-2)	. <u>-</u>	009 L <sub>D</sub>		
Level of Serv $D_R = 5.475 + 0.0$ $D_R = (pc/mi/ln)$ LOS = (Exhibit Speed Determ	00734 v <sub>R</sub> + ) 13-2) <b>mination</b>				D <sub>R</sub> = 48 LOS = F <b>Speed D</b>	3.1 (pc/ (Exhib	mi/ln) it 13-2)	on .	009 L <sub>D</sub>		
Level of Serv $D_R = 5.475 + 0.0$ $D_R = (pc/mi/ln$ LOS = (Exhibit) Speed Determ $M_S = (Exibit)$	00734 v <sub>R</sub> + ) 13-2) <b>mination</b> 3-11)				$D_{R} = 48$ $LOS = F$ $Speed D$ $D_{S} = 0.2$	3.1 (pc/ (Exhib <b>Deteri</b> 271 (Ex	mi/ln) it 13-2) <b>ninatic</b>	n 12)	009 L <sub>D</sub>		
Level of Serv $D_R = 5.475 + 0.0$ $D_R = (pc/mi/ln$ LOS = (Exhibit) Speed Determ $M_S = (Exibit)$ $S_R = (Exhibit)$	00734 v <sub>R</sub> + ) 13-2) <b>mination</b> 3-11) nibit 13-11)				$D_{R} = 48$ $LOS = F$ $Speed D$ $D_{S} = 0.2$ $S_{R} = 55$	3.1 (pc/ (Exhib <b>Deteri</b> 271 (Ex	mi/ln) it 13-2) <b>minatic</b> khibit 13-	12)	009 L <sub>D</sub>		
Level of Serv $D_R = 5.475 + 0.0$ $D_R = (pc/mi/ln$ LOS = (Exhibit) Speed Deterr $M_S = (Exibit)$ $S_R = mph (Exh)$ $S_0 = mph (Exh)$	00734 v <sub>R</sub> + ) 13-2) <b>mination</b> 3-11)				$\begin{array}{cccc} & & & & & & & & & \\ D_R = & & 48 \\ LOS = & & & & & \\ \textbf{Speed D} \\ \textbf{Speed D} \\ S_S = & & & & & \\ S_R = & & & & \\ S_0 = & & & & \\ \end{array}$	3.1 (pc/ (Exhib) (Exhib) (Exhib) 271 (Exp) 3.1 mph 3.2 mph	mi/ln) it 13-2) minatio thibit 13- (Exhibit	12) 13-12) 13-12)	009 L <sub>D</sub>		

		RAMP	S AND RAM	IP JUNCTI	ONS WO	RKSH	EET			
General Inf	formation			Site Infor						
Analyst	AJR		F	reeway/Dir of Tr	avel I	-26 EB				
Agency or Comp	any Atkin	ıs	Jı	unction		1010-EB (	Off to C	-D		
Date Performed	7/25/	/2014	Jı	urisdiction						
Analysis Time Pe	eriod PM F	Peak	Α	nalysis Year		2038 Build	d - Rive	r Center Site		
Project Description	on Navy Base IC	TF								
Inputs										
Upstream A	dj Ramp	1 '	ber of Lanes, N	4					Downstrea	am Adj
		Ramp Number		1					Ramp	
□Yes	On	Acceleration L	ane Length, L <sub>A</sub>						□Yes	On
✓ No	Off	Deceleration L	ane Length L <sub>D</sub>	400						
E NO		Freeway Volui	me, V <sub>r</sub>	5886					<b>☑</b> No	Off
L <sub>up</sub> =	ft	Ramp Volume		540					L <sub>down</sub> =	ft
uρ		1	, v <sub>R</sub> -Flow Speed, S <sub>FF</sub>							
V <sub></sub> =	veh/h								V <sub>D</sub> =	veh/h
<u> </u>		Ramp Free-Fl	ow Speed, S <sub>FR</sub>	55.0						
Conversio	n to pc/h Un	der Base (	Conditions							
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>H</sub>	/	f <sub>p</sub>	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>
reeway	5886	0.90	Level	12	0	0.94	3	1.00	69	32
Ramp	540	0.90	Level	9	0	0.95	7	1.00	6	27
JpStream										
DownStream										
		Merge Areas						Diverge Areas		
Estimation	of v <sub>12</sub>				Estimati	on of	12			
	V <sub>12</sub> = V <sub>F</sub>	( P )						V <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>	-)P	
_	12 1	1 101	10.7)		_					`
EQ =		ation 13-6 or			L <sub>EQ</sub> =			Equation 13-1		
P <sub>FM</sub> =	using	Equation (E	exhibit 13-6)		P <sub>FD</sub> =			436 using Equ	uation (Exhi	bit 13-7)
/ <sub>12</sub> =	pc/h				V <sub>12</sub> =		33	376 pc/h		
<sub>3</sub> or V <sub>av34</sub>	pc/h (	(Equation 13-	-14 or 13-17)		$V_3$ or $V_{av34}$		1	778 pc/h (Equ	ation 13-1	4 or 13-17
Is $V_3$ or $V_{av34} > 2$	2,700 pc/h?	s 🗌 No			Is V <sub>3</sub> or V <sub>av3</sub>	<sub>4</sub> > 2,700	pc/h? [	☐ Yes ☑ No		
	1.5 * V <sub>12</sub> /2 □ Ye					-		☐Yes ☑ No		
	· <del>-</del>		-16, 13-18, or			-		c/h (Equation	13-16. 13	-18. or 13
Yes,V <sub>12a</sub> =	13-19				If Yes,V <sub>12a</sub> =			9)		-,
Capacity C	hecks				Capacity	/ Chec	ks			
	Actual	С	apacity	LOS F?			Actual	Ca	pacity	LOS F
					V <sub>F</sub>		6932	Exhibit 13-8	9200	No
$V_{FO}$		Exhibit 13-8		1	V <sub>FO</sub> = V <sub>F</sub>	- V-	6305	Exhibit 13-8		No
* FO		EXHIBIT 13-0		1		*R				_
					V <sub>R</sub>		627	Exhibit 13-1		No
Flow Enter	ring Merge In				Flow En	tering	<u>Dive</u>	rge Influen		
	Actual		Desirable	Violation?		Act	ual	Max Desirat	le	Violation
$V_{R12}$		Exhibit 13-8			V <sub>12</sub>	337	6	Exhibit 13-8	4400:All	No
	ervice Deterr	nination (i	f not F)	-	Level of	Service	e De	terminatio	n (if not	F)
Level of Se					i e			.0086 V <sub>12</sub> - 0.	-	,
		12	<b>-</b> A					12 0.	υ D	
D <sub>R</sub> = 5.475 +	**				l ''	.7 (pc/m	,			
$D_{R} = 5.475 + 0.00$	ni/ln)				li 00 -		13-2)			
$D_R = 5.475 + 0$ $D_R = (pc/m)$ $D_R = (Exhilate)$	ni/ln) bit 13-2)				<del> </del>	(Exhibit				
$D_R = 5.475 + 0$ $D_R = (pc/m)$ $D_R = (Exhilos)$	ni/ln)				LOS = D	`		on		
$D_R = 5.475 + 0$ $O_R = (pc/m)$ OS = (Exhill) <b>Speed Determination</b>	hi/ln) bit 13-2) ermination				Speed D	`	inatio			
$D_R = 5.475 + 0.00$ $D_R = 0.$	ni/ln) bit 13-2) ermination it 13-11)				<b>Speed D</b> D <sub>s</sub> = 0.2	e <b>term</b> 224 (Exh	inatio	-12)		
$D_{\rm R}$ = 5.475 + $D_{\rm R}$ = (pc/m) OS = (Exhilt Speed Determine) $D_{\rm R}$ = (Exibit Speed Determine)	bit 13-2)  ermination it 13-11)  Exhibit 13-11)				<b>Speed D</b> D <sub>s</sub> = 0.2 S <sub>R</sub> = 56	Peterm 224 (Exh .0 mph (E	ination ibit 13 Exhibit	-12) 13-12)		
$D_{\rm R}$ = 5.475 + $D_{\rm R}$ = (pc/m) $D_{\rm R}$ = (Exhilt Speed Detection of the content of th	ni/ln) bit 13-2) ermination it 13-11)				<b>Speed D</b> $D_s = 0.2$ $S_R = 56$ $S_0 = 62$	e <b>term</b> 224 (Exh	ination ibit 13 Exhibit Exhibit	-12) 13-12) 13-12)		

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company	AJR Atkins		Highway/Direction of Trave		rai/Rem CD Off to
Date Performed Analysis Time Period	7/25/2014 AM Peak		Jurisdiction Analysis Year	2038 Bu Site	ild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plan	ning Data
Flow Inputs					
Volume, V AADT Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D	8091	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub> %RVs, P <sub>R</sub> General Terrain:	0.90 16 0 Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments				
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.926	
Speed Inputs			Calc Speed Adj and		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f		mph
Number of Lanes, N	4		f <sub>LW</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph		60.0	•
Base free-flow Speed, BFFS		mph	FFS	60.0	mph
LOS and Performanc	e Measures	3	Design (N)		
Operational (LOS) v <sub>p</sub> = (V or DDHV) / (PHF x I	N x f <sub>in</sub> ,		Design (N) Design LOS		
x f <sub>p</sub> )	<sup>□v</sup> 2427 47.6	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x x f_p)$	N x f <sub>HV</sub>	pc/h/ln
	51.0	mph nc/mi/ln	S		mph
D = v <sub>p</sub> / S LOS	51.0 F	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LO3	1		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed	BFFS - Ba		$E_R$ - Exhibits 11-10, 11-12 $E_T$ - Exhibits 11-10, 11-11, $f_p$ - Page 11-18 LOS, S, FFS, $v_p$ - Exhibits 11-3	11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1
DDHV - Directional design	nour volume		1., 0		

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		/ai/Rem CD Off to
Agency or Company	Atkins		From/To	CD On	a//Reili CD Oli lo
Date Performed	7/25/2014		Jurisdiction	0000 5	"/ D: 0 /
Analysis Time Period	PM Peak		Analysis Year	Site	ıild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plar	ning Data
Flow Inputs					
Volume, V AADT	5346	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 13	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D		1- //-	General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments				
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.939	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	4		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph		00.0	
LOS and Performanc	e Measures	 S	Design (N)		
			Design (N)		
Operational (LOS)			Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x I)$	N x f <sub>HV</sub> 1582	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x funz	
x f <sub>p</sub> )		<b>P</b> 3.1	x f <sub>p</sub> )	пν	pc/h/ln
S	60.0	mph	S S		mph
$D = v_p / S$	26.4	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	D		Required Number of Lanes	s, N	<b>P</b>
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed			f Evhihit 11 0
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>p</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		se free-flow	f <sub>p</sub> - Page 11-18	11.0	TRD - Page 11-1
speed	la		LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-∠,	
DDHV - Directional design	nour volume		1-0		

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## **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2038 Build-River Center Site AM Peak Navy Base ICTF Freeway/Direction Junction Segment ID

I-26 EB C-D EB Off to Aviation Ave 1020

## Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	1	1	1
Free-Flow Speed, FFS (mph)	55	55	45
Volume, V (veh/h)	1,010	484	526
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	5%	6%	5%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.98	0.97	0.98
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	1,150	554	599
Capacity Flow Rate, c (pc/h/ln)	2,200	2,200	2,100
v/c ratio	0.52	0.25	0.29
Density, D <sub>MD</sub> (pc/mi/ln)	20.1	9.7	10.5
LOS	C	Α	В

## Formulas and Reference Material

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

HCM 2010, Equation 11-2

$$D_{MD} =$$

HCM 2010, Equation 13-26

## Ramp Roadways Max Service Flow Rates

1 IOW Hales			
	Capacity		
FFS (mi/h)	(pc/h/ln)		
> 50	2,200		
>40-50	2,100		
>30-40	2,000		
≥20-30	1,900		
<20	1,800		

Source: HCM 2010, Exhibit 13-10

#### Diverge LOS Thresholds

21101g0 20	
	Density
LOS	(pc/mi/ln)
Α	≤10
В	>10-20
С	>20-28
D	>28-35
Е	>35
F	v/c > 1

#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2038 Build-River Center Site PM Peak Navy Base ICTF Freeway/Direction Junction Segment ID

I-26 EB C-D EB Off to Aviation Ave 1020

## Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	1	1	1
Free-Flow Speed, FFS (mph)	55	55	45
Volume, V (veh/h)	540	317	223
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	9%	7%	11%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.96	0.97	0.95
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	627	365	261
Capacity Flow Rate, c (pc/h/ln)	2,200	2,200	2,100
v/c ratio	0.29	0.17	0.12
Density, D <sub>MD</sub> (pc/mi/ln)	11.0	6.4	4.6
LOS	В	Α	Α

## Formulas and Reference Material

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

HCM 2010, Equation 11-2

$$D_{MD} =$$

HCM 2010, Equation 13-26

## Ramp Roadways Max Service Flow Rates

I IOW Na	iles
	Capacity
FFS (mi/h)	(pc/h/ln)
> 50	2,200
>40-50	2,100
>30-40	2,000
≥20-30	1,900
<20	1,800

Source: HCM 2010, Exhibit 13-10

#### Diverge LOS Thresholds

21101g0 20	
	Density
LOS	(pc/mi/ln)
Α	≤10
В	>10-20
С	>20-28
D	>28-35
Е	>35
F	v/c > 1

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	1025 - A On	Avia Off to Avia WB
Date Performed	7/25/2014		Jurisdiction	OII	
Analysis Time Period	AM Peak		Analysis Year	2038 Βι Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			es.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	968	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 6	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments				
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] <i>0.971</i>	
Speed Inputs			Calc Speed Adj and		
Lane Width		ft	<u> </u>		
Rt-Side Lat. Clearance		ft	f <sub>LW</sub>		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	55.0	mph	FFS	55.0	•
Base free-flow Speed,		mph	166	55.0	mph
BFFS					
LOS and Performanc	e Measures	<b>S</b>	Design (N)		
Operational (LOS)			Design (N)		
$v_p = (V \text{ or DDHV}) / (PHF x I)$	N x f		Design LOS		
$x f_p$	554	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	$N \times f_{HV}$	pc/h/ln
S	55.0	mph	x f <sub>p</sub> )		ролипп
D = v <sub>p</sub> / S	10.1	pc/mi/ln	S		mph
LOS	A	ролиши	$D = v_p / S$		pc/mi/ln
			Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed	E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens	sity	$E_{\rm T}$ - Exhibits 11-10, 11-11,		$f_{LC}$ - Exhibit 11-9
v <sub>p</sub> - Flow rate	FFS - Free	e-flow speed	$f_{\rm n}$ - Page 11-18		TRD - Page 11-1
LOS - Level of service	BFFS - Ba	ase free-flow	LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2	TND - Lage 11-1
speed DDHV - Directional design	hour volume		11-3		
DDITY - DITECTIONAL GESIGN					

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	1025 - A On	Avia Off to Avia WB
Date Performed	7/25/2014		Jurisdiction	On	
Analysis Time Period	PM Peak		Analysis Year	2038 Bu Site	ıild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	□Plar	nning Data
Flow Inputs					
Volume, V AADT	634	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 7	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D			%RVs, P <sub>R</sub> General Terrain:	0 Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments				
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] 0.966	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	55.0	mph	FFS	55.0	mph
Base free-flow Speed, BFFS		mph		55.0	Πρπ
LOS and Performanc	e Measures	 S	Design (N)		
			Design (N)		
Operational (LOS)			Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x   x f_p)$	N x f <sub>HV</sub> 365	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	pc/h/ln
S	55.0	mph	x f <sub>p</sub> )		·
D = v <sub>p</sub> / S	6.6	pc/mi/ln	S		mph
LOS	A	<b>P 3</b>	$D = v_p / S$		pc/mi/ln
-			Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens	-	E <sub>T</sub> - Exhibits 11-10, 11-11,		f <sub>LC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate		e-flow speed	f <sub>n</sub> - Page 11-18		TRD - Page 11-1
LOS - Level of service speed	BFFS - Ba	ase free-flow	LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	
DDHV - Directional design	hour volume		11-3		
			1		

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## **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2038 Build-River Center Site AM Peak Navy Base ICTF Freeway/Direction Junction Segment ID

I-26 EB C-D WB Aviation EB On Loop 1030

## Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	1	1	1
Free-Flow Speed, FFS (mph)	55	55	25
Volume, V (veh/h)	484	780	296
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, $P_T$	6%	4%	3%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.97	0.98	0.99
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	554	884	334
Capacity Flow Rate, c (pc/h/ln)	2,200	2,200	1,900
v/c ratio	0.25	0.40	0.18
Density, D <sub>MD</sub> (pc/mi/ln)	9.7	15.5	5.8
LOS	Α	В	A

## Formulas and Reference Material

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

HCM 2010, Equation 11-2

$$D_{MD} =$$

HCM 2010, Equation 13-26

## Ramp Roadways Max Service Flow Rates

1 IOW Hales				
	Capacity			
FFS (mi/h)	(pc/h/ln)			
> 50	2,200			
>40-50	2,100			
>30-40	2,000			
≥20-30	1,900			
<20	1,800			

Source: HCM 2010, Exhibit 13-10

#### Diverge LOS Thresholds

Bivorgo Eco Tiliochiciae			
	Density		
LOS	(pc/mi/ln)		
Α	≤10		
В	>10-20		
С	>20-28		
D	>28-35		
Е	>35		
F	v/c > 1		

#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2038 Build-River Center Site PM Peak Navy Base ICTF Freeway/Direction Junction Segment ID

I-26 EB C-D WB Aviation EB On Loop 1030

## Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	1	1	1
Free-Flow Speed, FFS (mph)	55	55	25
Volume, V (veh/h)	317	788	471
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	7%	4%	2%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.97	0.98	0.99
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	365	893	529
Capacity Flow Rate, c (pc/h/ln)	2,200	2,200	1,900
v/c ratio	0.17	0.41	0.28
Density, D <sub>MD</sub> (pc/mi/ln)	6.4	15.6	9.3
LOS	Α	В	А

## Formulas and Reference Material

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

HCM 2010, Equation 11-2

$$D_{MD} =$$

HCM 2010, Equation 13-26

#### Ramp Roadways Max Service Flow Rates

1 IOW Hales				
	Capacity			
FFS (mi/h)	(pc/h/ln)			
> 50	2,200			
>40-50	2,100			
>30-40	2,000			
≥20-30	1,900			
<20	1,800			

Source: HCM 2010, Exhibit 13-10

#### Diverge LOS Thresholds

Bivorgo EOO Tilloonolao				
	Density			
LOS	(pc/mi/ln)			
Α	≤10			
В	>10-20			
С	>20-28			
D	>28-35			
Е	>35			
F	v/c > 1			

0	1.6		REEWAY	VVEAV	v		I		
General	Informati	on			Site Info	rmation			
Analyst AJR Agency/Company Atkins Date Performed 7/25/2014 Analysis Time Period AM Peak			Freeway/Dir Weaving Seg Analysis Yea	gment Location	on 1040-	B - Aviation- EB Aviation t Build - River			
	ription Navy B	ase ICTF							
Inputs					1				
_	figuration nber of lanes, N ment length, L				Segment typ		0		C-D Roadwa Multilar Highwa
	-flow speed, F	0		55 mph	Freeway min Freeway max				225
					Terrain type	кіпішті сарас	ity, O <sub>IFL</sub>		Lev
Convers	ions to p	c/h Unde	r Base Co	ndition					
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	$f_{HV}$	fp	v (pc/h)
V <sub>FF</sub>	296	0.90	3	0	1.5	1.2	0.985	1.00	334
$V_{RF}$	314	0.90	12	0	1.5	1.2	0.943	1.00	370
/ <sub>FR</sub>	484	0.90	6	0	1.5	1.2	0.971	1.00	554
$V_{RR}$	0	0.90	0	0	1.5	1.2	1.000	1.00	0
$V_{NW}$	334			_			_	V =	1258
$V_{W}$	924								
√R	0.734								
Configu	ration Cha	aracteris	tics						
Minimum ma	neuver lanes,	N <sub>WL</sub>		2 lc	Minimum we	aving lane cl	nanges, $LC_{\min}$		924 lc/
Interchange	•			0.8 int/mi	Weaving lane changes, LC <sub>W</sub>			962 lc/	
	lane changes	141		1 lc/pc	Non-weaving lane changes, LC <sub>NW</sub>				0 lc/
Minimum FR	lane changes	, LC <sub>FR</sub>		1 lc/pc	Total lane changes, LC <sub>ALL</sub>			962 lc/	
Minimum RR	R lane changes	, LC <sub>RR</sub>		lc/pc	Non-weaving vehicle index, I <sub>NW</sub>			1	
Weaving	Segmen	t Speed,	Density, l	_evel of	Service,	and Cap	acity		
Weaving seg	gment flow rate	e, V		1258 pc/h				0.35	
Weaving seg	gment capacity	apacity, c <sub>w</sub> 2902 veh/h							44.7 mp
0 0	gment v/c ratio				Average weaving speed, S <sub>w</sub>				44.4 mp
	ment density,	·			- 1				45.3 mp
Level of Serv	vice, LUS			В	Maximum we	eaving length	, L <sub>MAX</sub>		10694
Chapter 13, "F	egments longer t Freeway Merge as that exceed the	and Diverge Se	egments".	-		solated merge	and diverge are	eas using the	procedure

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			REEWA	r WEAV	1		I		
Genera	I Informati	on			Site Info	rmation			
Analyst AJR Agency/Company Atkins Date Performed 7/25//2014 Analysis Time Period PM Peak  Project Description Navy Base ICTF			Freeway/Dir Weaving Seg Analysis Yea	gment Location	on 1040-	B - Aviation-l EB Aviation t Build - River			
Inputs	Scription Navy D	<u>ase 1011</u>							
Weaving c Weaving n Weaving s Freeway fr	onfiguration umber of lanes, Negment length, Leee-flow speed, F	s FS		55 mpn	Freeway min Freeway max Terrain type	imum speed,	$S_{MIN}$ ity, $C_{IFL}$		C-D Roadway Multilan Highway 1. 225 Leve
Conve	rsions to po	1	ı'	1	ı .				1 ( ()
,	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	f <sub>HV</sub>	fp	v (pc/h)
V <sub>FF</sub>	471	0.90	2	0	1.5	1.2	0.990	1.00	529
$V_{RF}$	559	0.90	6	0	1.5	1.2	0.971	1.00	640
$V_{FR}$	317	0.90	7	0	1.5	1.2	0.966	1.00	365
$V_{RR}$	0	0.90	0	0	1.5	1.2	1.000	1.00	0
$V_{NW}$	529							V =	1534
$V_{W}$	1005								
VR	0.655								
Config	uration Cha	aracteris	tics		•				
Minimum r	maneuver lanes,	$N_{WL}$		2 lc	Minimum we	aving lane cl	nanges, LC <sub>MIN</sub>		1005 lc/h
Interchang	je density, ID			0.8 int/mi	"			1043 lc/h	
Minimum F	RF lane changes	, LC <sub>RF</sub>		1 lc/pc	Non-weaving lane changes, LC <sub>NW</sub>			14 lc/h	
Minimum I	R lane changes	, LC <sub>FR</sub>		1 lc/pc	Total lane changes, LC <sub>ALL</sub>			1057 lc/h	
Minimum I	$\label{eq:minimum} \mbox{Minimum RR lane changes, LC}_{\mbox{\scriptsize RR}} \mbox{ lc/pc}$			Non-weaving vehicle index, I <sub>NW</sub>			23		
Weavir	ng Segmen	t Speed,	Density, l	Level of	Service,	and Cap	acity		
Weaving segment flow rate, v 1534 pc/h			, ,			0.387			
Weaving segment capacity, c <sub>w</sub> 3067 veh/h						43.9 mph			
Weaving segment v/c ratio 0.495			"			43.8 mph			
			Average non		1111		44.1 mph		
	ervice, LOS			В	Maximum we	eaving length	, L <sub>MAX</sub>		9696 f
Notes									
Chapter 13,	segments longer t "Freeway Merge anes that exceed the	and Diverge Se	egments".			solated merge	and diverge are	eas using the	procedures of

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	T	
General Information			Site Information		
Analyst Agency or Company Date Performed Analysis Time Period	AJR Atkins 7/25/2014 AM Peak		Highway/Direction of Trave From/To Jurisdiction Analysis Year	1045-Re Remoul	emount Off to
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Pla	nning Data
Flow Inputs					
Volume, V AADT Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D	1220	veh/h veh/day veh/h	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub> %RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0.90 7 0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub> E <sub>T</sub>	1.00 1.5		$E_R$ $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1.2 0.966	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft	Caro Opoca / taj arra		
Rt-Side Lat. Clearance Number of Lanes, N	2	ft	f <sub>LW</sub>		mph mph
Total Ramp Density, TRD FFS (measured) Base free-flow Speed, BFFS	55.0	ramps/mi mph mph	TRD Adjustment FFS	55.0	mph mph
LOS and Performanc	e Measures	 }	Design (N)		
Operational (LOS)  v <sub>p</sub> = (V or DDHV) / (PHF x l x f <sub>p</sub> ) S D = v <sub>p</sub> / S LOS		pc/h/ln mph pc/mi/ln	Design (N) Design LOS $v_p = (V \text{ or DDHV}) / (PHF \text{ x} \text{ x} f_p)$ S $D = v_p / S$ Required Number of Lanes		pc/h/ln mph pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed DDHV - Directional design	BFFS - Ba		$E_R$ - Exhibits 11-10, 11-12 $E_T$ - Exhibits 11-10, 11-11, $f_p$ - Page 11-18 LOS, S, FFS, $v_p$ - Exhibits 11-3	11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed Analysis Time Period	AJR Atkins 4/25/2014 PM Peak		Highway/Direction of Trave From/To Jurisdiction Analysis Year	1045-Re Remour	emount Off to
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			es.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D	2060	veh/h veh/day veh/h	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub> %RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0.90 4 0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub> E <sub>T</sub>	1.00 1.5		$E_R$ $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1.2 1)] 0.980	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft	Guio Opoca / taj ana i		
Rt-Side Lat. Clearance		ft	f		mnh
Number of Lanes, N	2		f <sub>LW</sub>		mph
Total Ramp Density, TRD	_	ramps/mi	f <sub>LC</sub>		mph
FFS (measured)	55.0	mph	TRD Adjustment		mph
Base free-flow Speed, BFFS	00.0	mph	FFS	55.0	mph
LOS and Performanc	e Measures	;	Design (N)		
Operational (LOS) v <sub>p</sub> = (V or DDHV) / (PHF x l x f <sub>p</sub> ) S	N x f <sub>HV</sub> 1167 55.0	pc/h/ln mph	$\frac{\text{Design (N)}}{\text{Design LOS}}$ $v_p = (V \text{ or DDHV}) / (PHF \text{ x})$ $x f_p)$	N x f <sub>HV</sub>	pc/h/ln
			S		mph
D = v <sub>p</sub> / S LOS	21.2 C	pc/mi/ln	$D = v_p / S$ Required Number of Lanes	s, N	pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed DDHV - Directional design	BFFS - Ba		$E_R$ - Exhibits 11-10, 11-12 $E_T$ - Exhibits 11-10, 11-11, $f_p$ - Page 11-18 LOS, S, FFS, $v_p$ - Exhibits 11-3	11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1

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#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2038 Build-River Center Site AM Peak Navy Base ICTF Freeway/Direction Junction Segment ID

I-26 EB C-D Remount EB On Loop 1050

## Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	1	1	1
Free-Flow Speed, FFS (mph)	55	55	25
Volume, V (veh/h)	610	973	363
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	7%	5%	2%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.97	0.98	0.99
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	702	1,108	407
Capacity Flow Rate, c (pc/h/ln)	2,200	2,200	1,900
v/c ratio	0.32	0.50	0.21
Density, D <sub>MD</sub> (pc/mi/ln)	12.3	19.4	7.1
LOS	В	В	А

## Formulas and Reference Material

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

HCM 2010, Equation 11-2

$$D_{MD} =$$

HCM 2010, Equation 13-26

# Ramp Roadways Max Service Flow Rates

1 low hates				
	Capacity			
FFS (mi/h)	(pc/h/ln)			
> 50	2,200			
>40-50	2,100			
>30-40	2,000			
≥20-30	1,900			
<20	1,800			

Source: HCM 2010, Exhibit 13-10

#### Diverge LOS Thresholds

21101g0 20	
	Density
LOS	(pc/mi/ln)
Α	≤10
В	>10-20
С	>20-28
D	>28-35
Е	>35
F	v/c > 1

#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 3/20/2014 2038 Build-River Center Site PM Peak Navy Base ICTF Freeway/Direction Junction Segment ID I-26 EB C-D Remount EB On Loop 1050

## Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	1	1	1
Free-Flow Speed, FFS (mph)	55	55	25
Volume, V (veh/h)	1,030	1,448	418
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	4%	3%	2%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.98	0.99	0.99
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	1,167	1,633	469
Capacity Flow Rate, c (pc/h/ln)	2,200	2,200	1,900
v/c ratio	0.53	0.74	0.25
Density, D <sub>MD</sub> (pc/mi/ln)	20.4	28.6	8.2
LOS	С	D	Α

## Formulas and Reference Material

$$f_{HV} = \frac{1}{1 + P_T(E_{T^*}1) + P_R(E_{R^*}-1)} \qquad \text{HCM 2010, Equation 11-3}$$
 
$$V_p = \frac{V}{PHF^*N^*f_{HV}^*f_P} \qquad \text{HCM 2010, Equation 11-2}$$
 
$$D_{MD} = \frac{0.0175^*V_f}{PHCM 2010, Equation 13-26}$$

Ν

Ramp Roadways Max Service Flow Rates

Flow Rates				
	Capacity			
FFS (mi/h)	(pc/h/ln)			
> 50	2,200			
>40-50	2,100			
>30-40	2,000			
≥20-30	1,900			
<20	1,800			

Source: HCM 2010, Exhibit 13-10

Diverge LOS Thresholds

Bivorgo LOO Tilloonolao				
	Density			
LOS	(pc/mi/ln)			
Α	≤10			
В	>10-20			
С	>20-28			
D	>28-35			
Е	>35			
F	v/c > 1			

			REEWA	WEAV			Γ		
General	Information	on			Site Info	rmation			
Analyst Agency/Con Date Perfori Analysis Tin	med	AJR Atkins 7/25/20 AM Pea			Freeway/Dir Weaving Seg Analysis Yea	gment Location		B Avi-Rem C-D Build - River	
Inputs	onpuon wavy Bo	400 1011							
Weaving seg Freeway fre	mber of lanes, N gment length, L <sub>s</sub> e-flow speed, FI	S FS		One-Sided 5 1850ft 60 mph	Segment typ Freeway min Freeway max Terrain type	imum speed,			Freewa 1 230 Leve
Convers	sions to po	T .	ľ	T .	W .	1 _			1
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	ER	f <sub>HV</sub>	fp	v (pc/h)
$V_{FF}$	4557	0.90	14	0	1.5	1.2	0.935	1.00	5418
$V_{RF}$	548	0.90	14	0	1.5	1.2	0.935	1.00	652
$V_{FR}$	3534	0.90	30	0	1.5	1.2	0.870	1.00	4516
$V_{RR}$	425	0.90	30	0	1.5	1.2	0.870	1.00	543
$V_{NW}$	5961				V =			11129	
$V_{W}$	5168								
VR	0.464								
Configu	ration Cha	aracterist	tics						
Minimum m	aneuver lanes, l	$N_{WL}$		2 lc	Minimum we	aving lane cl	nanges, LC <sub>MIN</sub>		lc/h
Interchange	density, ID			0.7 int/mi	Weaving lan	e changes, L	$C_{W}$		lc/h
Minimum R	F lane changes,	$LC_{RF}$		2 lc/pc	Non-weaving lane changes, LC <sub>NW</sub>			lc/h	
Minimum FI	R lane changes,	$LC_{FR}$		0 lc/pc	Total lane changes, LC <sub>ALL</sub>				lc/h
Minimum R	R lane changes,	, LC <sub>RR</sub>	lc/pc No		Non-weaving vehicle index, I <sub>NW</sub>			656	
Weavin	g Segment	t Speed,	Density, l	Level of	Service,	and Cap	acity		
Weaving se	gment flow rate	, V		11129 pc/h		ensity factor,			
Weaving se	gment capacity,	, c <sub>w</sub>	4830 veh/h			Weaving segment speed, S			mph
Weaving se	gment v/c ratio			2.153					mph
ľ	gment density, I	D		pc/mi/ln	Average non-weaving speed, S <sub>NW</sub>			mph	
Level of Sei	rvice, LOS			F	Maximum we	eaving length	ı, L <sub>MAX</sub>		7413 f
Notes									
Chapter 13, "	egments longer to Freeway Merge a es that exceed the	and Diverge Se	gments".	•		solated merge	and diverge are	eas using the p	procedures of

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			REEWAY	WEAV	W				
General	Informati	on			Site Info	rmation			
Analyst Agency/Com Date Perforn Analysis Tim Project Desc	ned	AJR Atkins 7/25/20 PM Pe			Freeway/Dir Weaving Se Analysis Yea	gment Locati		B Avi-Rem C-D Build - River	
Inputs	,								
Weaving seg Freeway free	mber of lanes, N gment length, L e-flow speed, F	s FS		One-Sided 5 1850ft 60 mph	Segment typ Freeway mir Freeway ma Terrain type	nimum speed			Freeway 15 2300 Leve
Convers	ions to po	c/h Unde	r Base Co	ndition	S		,		
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	$f_{HV}$	fp	v (pc/h)
$V_{FF}$	2830	0.90	11	0	1.5	1.2	0.948	1.00	3317
$V_{RF}$	766	0.90	11	0	1.5	1.2	0.948	1.00	898
$V_{FR}$	2516	0.90	31	0	1.5	1.2	0.866	1.00	3229
$V_{RR}$	682	0.90	31	0	1.5	1.2	0.866	1.00	875
V <sub>NW</sub>	4192		•	•	•	•		V =	8319
V <sub>W</sub>	4127								
VR	0.496								
Configu	ration Cha	aracteris	tics						
Minimum ma	aneuver lanes,	N <sub>WL</sub>		2 lc	Minimum we	eaving lane c	hanges, LC <sub>MIN</sub>		lc/h
Interchange	density, ID			0.7 int/mi	Weaving lan	ne changes, l	_C <sub>w</sub>		lc/h
Minimum RF	lane changes	, LC <sub>RF</sub>		2 lc/pc	Non-weaving lane changes, LC <sub>NW</sub>			lc/h	
Minimum FF	R lane changes,	, LC <sub>FR</sub>		0 lc/pc	Total lane changes, LC <sub>ALL</sub>				lc/h
Minimum RF	R lane changes	, LC <sub>RR</sub>		lc/pc	Non-weaving vehicle index, I <sub>NW</sub> 4				407
Weaving	g Segmen	t Speed,	Density, I	Level of	Service,	and Ca	pacity		
Weaving seg	gment flow rate	, V		8319 pc/h	Weaving into	ensity factor,	W		
Weaving segment capacity, c <sub>w</sub> 4586 veh/h						mph			
Weaving segment v/c ratio 1.719			Average weaving speed, S <sub>w</sub>			mph			
	ving segment density, D pc/mi/ln			Average nor				mph	
Level of Service, LOS F Maximum weaving length, L <sub>MAX</sub> 7					7781 ft				
	egments longer t Freeway Merge a			ength should I	oe treated as is	solated merge	and diverge ar	eas using the	procedures of

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	1065 - I- On	-526 CD Off to CD
Date Performed	4/25/2014		Jurisdiction		
Analysis Time Period	AM Peak		Analysis Year	2038 Bu Site	iild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	☐ Plar	ning Data
Flow Inputs					
Volume, V AADT	5105	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 14	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length	Level mi	
Calaulata Flaur Adiua	1		Up/Down %		
Calculate Flow Adjus					
$f_p$	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] 0.935	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	3		$f_{LC}$		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			·
LOS and Performanc	e Measures	3	Design (N)		
			Design (N)		
Operational (LOS)	NI £		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x I)$	N X I <sub>HV</sub> 2023	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	N- N
x f <sub>p</sub> )	<i>EC</i> 0	ma m la	$x f_p$ )		pc/h/ln
S D = v / S	56.8	mph	s		mph
$D = v_p / S$	35.6	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	E		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed			f Evhihit 11 0
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>n</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18	11 0	TRD - Page 11-1
speed	la		LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-∠,	
DDHV - Directional design	nour volume		I - J		

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	1065 - I- On	-526 CD Off to CD
Date Performed	7/25/2014		Jurisdiction		
Analysis Time Period	PM Peak		Analysis Year	2038 Bu Site	iild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			es.(N)	Plar	ning Data
Flow Inputs					
Volume, V AADT	3596	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 11	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments		·		
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] <i>0.948</i>	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft	<u> </u>		
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	3		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	•
Base free-flow Speed,		mph	1662	60.0	mph
BFFS					
LOS and Performanc	e Measures	<u> </u>	Design (N)		
Operational (LOS)			Design (N)		
$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f		Design LOS		
$x f_p$	1405	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	$N \times f_{HV}$	pc/h/ln
S	60.0	mph	x f <sub>p</sub> )		ролили
D = v <sub>p</sub> / S	23.4	pc/mi/ln	S		mph
LOS	23.4 C	P0/1111/111	$D = v_p / S$		pc/mi/ln
			Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed	E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens	ity	$E_{\rm T}$ - Exhibits 11-10, 11-11,		f <sub>LC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate	FFS - Free	e-flow speed	f <sub>n</sub> - Page 11-18		TRD - Page 11-1
LOS - Level of service	BFFS - Ba	ase free-flow	LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2	IND - Lage 11-1
speed DDHV - Directional design	hour volume		11-3	· · ∠,	
DDITY - Directional design	noui voiuille		1		

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#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2038 Build-River Center Site AM Peak Navy Base ICTF Freeway/Direction Junction Segment ID I-26 EB C-D EB Off to I-526 WB 1070

## Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	2	1	1
Free-Flow Speed, FFS (mph)	55	55	45
Volume, V (veh/h)	3,959	1,422	2,537
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	30%	53%	17%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.87	0.79	0.92
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	2,529	1,999	3,058
Capacity Flow Rate, c (pc/h/ln)	2,200	2,200	2,100
v/c ratio	1.15	0.91	1.46
Density, D <sub>MD</sub> (pc/mi/ln)	44.3	35.0	53.5
LOS	F	D	F

## Formulas and Reference Material

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

HCM 2010, Equation 11-2

$$D_{MD} =$$

HCM 2010, Equation 13-26

## Ramp Roadways Max Service Flow Rates

I IOW Na	162
	Capacity
FFS (mi/h)	(pc/h/ln)
> 50	2,200
>40-50	2,100
>30-40	2,000
≥20-30	1,900
<20	1,800

Source: HCM 2010, Exhibit 13-10

#### Diverge LOS Thresholds

21101g0 20	
	Density
LOS	(pc/mi/ln)
Α	≤10
В	>10-20
С	>20-28
D	>28-35
Е	>35
F	v/c > 1

#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2038 Build-River Center Site PM Peak Navy Base ICTF Freeway/Direction Junction Segment ID I-26 EB C-D EB Off to I-526 WB 1070

## Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	2	1	1
Free-Flow Speed, FFS (mph)	55	55	45
Volume, V (veh/h)	3,198	1,163	2,035
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, $P_T$	31%	55%	18%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.87	0.78	0.92
Demand Flow Rate, $v_p$ (pc/h/ln)	2,052	1,648	2,465
Capacity Flow Rate, c (pc/h/ln)	2,200	2,200	2,100
v/c ratio	0.93	0.75	1.17
Density, D <sub>MD</sub> (pc/mi/ln)	35.9	28.8	43.1
LOS	Е	D	F

## Formulas and Reference Material

$$f_{HV} = \frac{\frac{1}{1 + P_T(E_{T}^{-1}) + P_R(E_{R}^{-1})}}{V_p} + \frac{V}{PHF^*N^*f_{HV}^*f_P} + \frac{V}{PHF^*N^*f_{HV}^*$$

$$D_{MD} = \frac{0.0175^*v_f}{N}$$
 HCM 2010, Equation 13-26

Ramp Roadways Max Service
Flow Rates

i iow na	ies
	Capacity
FFS (mi/h)	(pc/h/ln)
> 50	2,200
>40-50	2,100
>30-40	2,000
≥20-30	1,900
<20	1,800

Source: HCM 2010, Exhibit 13-10

#### Diverge LOS Thresholds

- 3	
	Density
LOS	(pc/mi/ln)
Α	≤10
В	>10-20
С	>20-28
D	>28-35
Е	>35
F	v/c > 1

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	T	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>I-26 EB</i>	C-D
Agency or Company	Atkins		From/To	1075-15	26 WB Off to 1526
Date Performed	7/25/2014		Jurisdiction	WB On	
Analysis Time Period	AM Peak		Analysis Year	2038 Βι Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	☐ Plar	nning Data
Flow Inputs					
Volume, V AADT	2844	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 53	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi	
Calculate Flow Adjus	tments		·		
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$		
Speed Inputs	7.0		Calc Speed Adj and		
Lane Width		ft	Odic Opeca Auj ana		
Rt-Side Lat. Clearance		ft	t .		ma m la
Number of Lanes, N	2	10	f <sub>LW</sub>		mph
Total Ramp Density, TRD	-	ramps/mi	f <sub>LC</sub>		mph
FFS (measured)	55.0	mph	TRD Adjustment	55.0	mph
Base free-flow Speed,	00.0	·	FFS	55.0	mph
BFFS		mph			
LOS and Performanc	e Measures	3	Design (N)		
Operational (LOC)			Design (N)		
Operational (LOS)	N v f		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x I x f_p)$	1N A 1HV 1999	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	pc/h/ln
s	54.0	mph	x f <sub>p</sub> )		la
$D = v_p / S$	37.0	pc/mi/ln	S D = v / S		mph
Los	E		$D = v_p / S$ Required Number of Lanes	s. N	pc/mi/ln
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed			
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>n</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18	44.0	TRD - Page 11-11
speed DDHV - Directional design	hour volume		LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-2,	
DDITY Directional design	noar volullie				

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	T	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		C-D 26 WB Off to 1526
Agency or Company	Atkins		From/To	WB On	
Date Performed	7/25/2014		Jurisdiction	2028 Bi	ıild - River Center
,	PM Peak		Analysis Year	Site	ilia - River Ceriler
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	∐ Plar	nning Data
Flow Inputs			D 1 11 E 1 DIE	2.22	
Volume, V AADT	2326	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 55	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments				
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] <i>0.784</i>	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	55.0	mph	FFS	55.0	mph
Base free-flow Speed, BFFS		mph		00.0	
LOS and Performanc	e Measures	 S	Design (N)		
			Design (N)		
Operational (LOS)			Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x I)$	N x f <sub>HV 1648</sub>	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f	
x f <sub>p</sub> )	7070	p 0/11/111	$x f_p$	· · · · · HV	pc/h/ln
S	55.0	mph	S S		mph
$D = v_p / S$	30.0	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	D		Required Number of Lanes	s. N	релипп
 Glossary			Factor Location		
N - Number of lanes	S - Spee	ed			
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>n</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18		TRD - Page 11-1
speed			LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	
DDHV - Directional design	hour volume		11-3		
			•		

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			REEWAY	VVEAV			I		
Genera	al Informati	on			Site Info	rmation			
Project De		AJR Atkins 3/20/20 AM Pea			Freeway/Dir Weaving Seg Analysis Yea	gment Location	on 1080	EB C-D - I-526 WB to Build - River	
Inputs					1				
Weaving n	onfiguration number of lanes, N egment length, L			One-Sided 2	Segment type	e			C-D Roadway Multiland Highway
_	ee-flow speed, F	0		55 mph	Freeway min	imum speed,	, S <sub>MIN</sub>		1:
	•				Freeway max Terrain type	xımum capac	ity, C <sub>IFL</sub>		2250 Leve
Conve	rsions to po	c/h Unde	Base Co	ndition					LOVO
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	$f_{HV}$	fp	v (pc/h)
V <sub>FF</sub>	0	0.90	0	0	1.5	1.2	1.000	1.00	0
V <sub>RF</sub>	556	0.90	8	0	1.5	1.2	0.962	1.00	642
V <sub>FR</sub>	1422	0.90	53	0	1.5	1.2	0.791	1.00	1999
$V_{RR}$	0	0.90	0	0	1.5	1.2	1.000	1.00	0
$V_{NW}$	0			•			•	V =	2641
V <sub>W</sub>	2641								•
VR	1.000								
Config	uration Cha	aracterist	ics						
Minimum	maneuver lanes,	N <sub>WL</sub>		2 lc	Minimum we	aving lane ch	nanges, LC <sub>MIN</sub>	I	lc/h
Interchanç	ge density, ID			0.8 int/mi	Weaving lane changes, LC <sub>w</sub>				lc/h
	RF lane changes,	IM			Non-weaving lane changes, LC <sub>NW</sub>				lc/h
Minimum	FR lane changes,	, LC <sub>FR</sub>		1 lc/pc	Total lane changes, LC <sub>ALL</sub>				lc/h
Minimum	RR lane changes	, LC <sub>RR</sub>		lc/pc	Non-weaving vehicle index, I <sub>NW</sub>				0
Weavir	ng Segmen	t Speed,	Density, I	_evel of	Service,	and Cap	acity		
Weaving s	segment flow rate	, V		2641 pc/h		ensity factor,			
Weaving segment capacity, c <sub>w</sub> 2400 v			2400 veh/h				mph		
ı	segment v/c ratio	Б		1.100		aving speed,	••		mph
							mph		
	CI VICE, LUS			F	iviaximum we	eaving length	I, L <sub>MAX</sub>		14232 ft
Chapter 13	segments longer t , "Freeway Merge a mes that exceed the	and Diverge Se	gments".			solated merge	and diverge ar	eas using the	procedures of

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			REEWA	VVEAV	1		I		
Genera	l Information	on			Site Info	rmation			
Analyst AJR Agency/Company Atkins Date Performed 7/25/2014 Analysis Time Period PM Peak  Project Description Navy Base ICTF					Freeway/Dir Weaving Seg Analysis Yea	gment Location		B C-D - I-526 WB to Build - River	
Inputs	scription <i>Navy Bi</i>	ase ICTF							
Weaving co Weaving n Weaving so Freeway fr	onfiguration umber of lanes, N egment length, L ee-flow speed, Fl	s =S		55 mph	Freeway min Freeway max Terrain type	imum speed,			C-D Roadway Multilan Highway 1: 225 Leve
Convei	rsions to po	1	II.	II .	ű –	ı –			1
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	f <sub>HV</sub>	fp	v (pc/h)
$V_{FF}$	0	0.90	0	0	1.5	1.2	1.000	1.00	0
$V_{RF}$	490	0.90	8	0	1.5	1.2	0.962	1.00	566
$V_{FR}$	1163	0.90	55	0	1.5	1.2	0.784	1.00	1648
$V_{RR}$	0	0.90	0	0	1.5	1.2	1.000	1.00	0
$V_{NW}$	0							V =	2214
$V_{W}$	2214								
VR	1.000								
Config	uration Cha	aracteris	tics		1				
Minimum r	maneuver lanes, l	$N_{WL}$		2 lc	Minimum we	eaving lane ch	nanges, LC <sub>MIN</sub>		2214 lc/h
Interchang	e density, ID			0.8 int/mi	Weaving lane changes, LC <sub>w</sub> 2			2259 lc/h	
Minimum F	RF lane changes,	$LC_{RF}$		1 lc/pc	Non-weaving lane changes, LC <sub>NW</sub>			0 lc/h	
Minimum F	R lane changes,	$LC_FR$		1 lc/pc	Total lane changes, LC <sub>ALL</sub>			2259 lc/h	
Minimum F	RR lane changes,	, LC <sub>RR</sub>		lc/pc	Non-weaving	g vehicle inde	ex, I <sub>NW</sub>		C
Weavir	ng Segment	t Speed,	Density, l	_evel of	Service,	and Cap	acity		
Weaving s	egment flow rate	, V		2214 pc/h	Weaving intensity factor, W			0.627	
Weaving segment capacity, c <sub>w</sub> 2400 veh/h			Weaving segment speed, S			39.6 mph			
	egment v/c ratio			0.923	'   "			39.6 mph	
Weaving segment density, D 28.0 pc/mi/ln					Average non		1111		33.7 mph
Level of So	ervice, LOS			С	Maximum we	eaving length	, L <sub>MAX</sub>		14232 f
Notes									
Chapter 13,	segments longer the "Freeway Merge anes that exceed the	and Diverge Se	egments".			solated merge	and diverge are	eas using the	procedures of

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company	AJR Atkins		Highway/Direction of Trave		C-D 26 EB Off to 1526
Date Performed Analysis Time Period	7/25/2014 AM Peak		Jurisdiction Analysis Year	2038 Bu Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plar	ning Data
Flow Inputs					
Volume, V AADT Peak-Hr Prop. of AADT, K	1112	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub> %RVs, P <sub>R</sub>	0.90 8 0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length Up/Down %	Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub>	1.00		$E_R$	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] 0.962	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	55.0	mph	FFS	55.0	mph
Base free-flow Speed, BFFS		mph		00.0	тіріі
LOS and Performanc	e Measures	3	Design (N)		
Operational (LOS) v <sub>p</sub> = (V or DDHV) / (PHF x l	N x f <sub>uv</sub>		Design (N) Design LOS		
x f <sub>p</sub> )	55.0	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x x f_p)$	N x f <sub>HV</sub>	pc/h/ln
	55.0 11.7	mph nc/mi/ln	S		mph
D = v <sub>p</sub> / S LOS	11.7 В	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LUS	Ь		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed	BFFS - Ba		E <sub>R</sub> - Exhibits 11-10, 11-12 E <sub>T</sub> - Exhibits 11-10, 11-11, f <sub>p</sub> - Page 11-18 LOS, S, FFS, v <sub>p</sub> - Exhibits	11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1
DDHV - Directional design	hour volume		11-3		

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company	AJR Atkins		Highway/Direction of Trave From/To		C-D 26 EB Off to 1526
Date Performed Analysis Time Period	4/25/2014 PM Peak		Jurisdiction Analysis Year	2038 Bu Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	☐ Plar	nning Data
Flow Inputs					
Volume, V AADT Peak-Hr Prop. of AADT, K	980	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub> %RVs, P <sub>R</sub>	0.90 8 0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length Up/Down %	Level mi	
Calculate Flow Adjus	tments		·		
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] 0.962	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		$f_{LC}$		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	55.0	mph	FFS	55.0	mph
Base free-flow Speed, BFFS		mph			'
LOS and Performanc	e Measures	6	Design (N)		
Operational (LOS) v <sub>p</sub> = (V or DDHV) / (PHF x I	N x f		Design (N) Design LOS		
x t <sub>p</sub> )		pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x x f_p)$	N x f <sub>HV</sub>	pc/h/ln
S D = v / S	55.0	mph	s		mph
$D = v_p / S$	10.3	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	Α		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed			$E_R$ - Exhibits 11-10, 11-12 $E_T$ - Exhibits 11-10, 11-11, $f_p$ - Page 11-18 LOS, S, FFS, $v_p$ - Exhibits	11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1
DDHV - Directional design	hour volume		11-3		

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## **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2038 Build-River Center Site AM Peak Navy Base ICTF Freeway/Direction Junction Segment ID

I-26 EB I-526 EB Ramp Split 1088

## Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	2	2	1
Free-Flow Speed, FFS (mph)	55	55	55
Volume, V (veh/h)	2,411	2,112	299
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	9%	10%	3%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.96	0.95	0.99
Demand Flow Rate, $v_p$ (pc/h/ln)	1,400	1,232	337
Capacity Flow Rate, c (pc/h/ln)	2,200	2,200	2,200
v/c ratio	0.64	0.56	0.15
Density, D <sub>MD</sub> (pc/mi/ln)	24.5	21.6	5.9
LOS	С	C	Α

## Formulas and Reference Material

$$f_{HV} = \frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

$$\frac{V}{P} = \frac{V}{PHF^*N^*f_{HV}^*f_{P}}$$

HCM 2010, Equation 11-2

$$D_{MD} = \frac{0.0175^*v_f}{N}$$

HCM 2010, Equation 13-26

#### Ramp Roadways Max Service Flow Rates

	Capacity
FFS (mi/h)	(pc/h/ln)
> 50	2,200
>40-50	2,100
>30-40	2,000
≥20-30	1,900
<20	1,800

Source: HCM 2010, Exhibit 13-10

#### Diverge LOS Thresholds

ziroigo zoo Tilioonoido			
	Density		
LOS	(pc/mi/ln)		
Α	≤10		
В	>10-20		
С	>20-28		
D	>28-35		
Е	>35		
F	v/c > 1		

#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 3/20/2014 2038 Build-River Center Site PM Peak Navy Base ICTF Freeway/Direction Junction Segment ID

I-26 EB I-526 EB Ramp Split 1088

## Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	2	2	1
Free-Flow Speed, FFS (mph)	55	55	55
Volume, V (veh/h)	2,786	2,442	344
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	7%	7%	3%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.97	0.97	0.99
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	1,602	1,404	388
Capacity Flow Rate, c (pc/h/ln)	2,200	2,200	2,200
v/c ratio	0.73	0.64	0.18
Density, D <sub>MD</sub> (pc/mi/ln)	28.0	24.6	6.8
LOS	С	C	Α

## Formulas and Reference Material

$$f_{HV}\,=\,$$

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

HCM 2010, Equation 11-2

$$D_{MD} =$$

HCM 2010, Equation 13-26

## Ramp Roadways Max Service Flow Rates

1 IOW Hates		
	Capacity	
FFS (mi/h)	(pc/h/ln)	
> 50	2,200	
>40-50	2,100	
>30-40	2,000	
≥20-30	1,900	
<20	1,800	

Source: HCM 2010, Exhibit 13-10

#### Diverge LOS Thresholds

- 3	
	Density
LOS	(pc/mi/ln)
Α	≤10
В	>10-20
С	>20-28
D	>28-35
Е	>35
F	v/c > 1

#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 3/20/2014 2038 Build-River Center Site AM Peak Navy Base ICTF Freeway/Direction Junction Segment ID I-26 EB C-D I-526 EB On 1090

## Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	1	1	1
Free-Flow Speed, FFS (mph)	55	55	45
Volume, V (veh/h)	556	855	299
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	8%	6%	3%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, f <sub>HV</sub>	0.96	0.97	0.99
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	642	979	337
Capacity Flow Rate, c (pc/h/ln)	2,200	2,200	2,100
v/c ratio	0.29	0.45	0.16
Density, D <sub>MD</sub> (pc/mi/ln)	11.2	17.1	5.9
LOS	В	В	А

## Formulas and Reference Material

$$f_{HV} =$$

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

HCM 2010, Equation 11-2

$$D_{MD} =$$

HCM 2010, Equation 13-26

## Ramp Roadways Max Service Flow Rates

1 IOW Hates		
	Capacity	
FFS (mi/h)	(pc/h/ln)	
> 50	2,200	
>40-50	2,100	
>30-40	2,000	
≥20-30	1,900	
<20	1,800	

Source: HCM 2010, Exhibit 13-10

#### Diverge LOS Thresholds

21101g0 20	
	Density
LOS	(pc/mi/ln)
Α	≤10
В	>10-20
С	>20-28
D	>28-35
Е	>35
F	v/c > 1

#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2038 Build-River Center Site PM Peak Navy Base ICTF Freeway/Direction Junction Segment ID I-26 EB C-D I-526 EB On 1090

## Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	1	1	1
Free-Flow Speed, FFS (mph)	55	55	45
Volume, V (veh/h)	490	834	344
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	8%	6%	3%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.96	0.97	0.99
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	566	954	388
Capacity Flow Rate, c (pc/h/ln)	2,200	2,200	2,100
v/c ratio	0.26	0.43	0.18
Density, D <sub>MD</sub> (pc/mi/ln)	9.9	16.7	6.8
LOS	Α	В	А

## Formulas and Reference Material

$$f_{HV} =$$

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

HCM 2010, Equation 11-2

$$D_{MD} =$$

HCM 2010, Equation 13-26

## Ramp Roadways Max Service Flow Rates

Flow Rates						
	Capacity					
FFS (mi/h)	(pc/h/ln)					
> 50	2,200					
>40-50	2,100					
>30-40	2,000					
≥20-30	1,900					
<20	1,800					

Source: HCM 2010, Exhibit 13-10

#### Diverge LOS Thresholds

21101g0 20	
	Density
LOS	(pc/mi/ln)
Α	≤10
В	>10-20
С	>20-28
D	>28-35
Е	>35
F	v/c > 1

_			REEWAY	( WEAV			Γ		
General Information					Site Information				
Analyst AJR Agency/Company Atkins Date Performed 7/25/2014 Analysis Time Period AM Peak  Project Description Navy Base ICTF				Freeway/Dir Weaving Seç Analysis Yea	gment Locatio			Montague SB Center Site	
Inputs					,				
Weaving se Freeway fre	mber of lanes, N gment length, L <sub>s</sub> e-flow speed, FR	S S		One-Sided 4 1550ft 60 mph	Terrain type	e iimum speed, ximum capac			Freewa 1 230 Leve
Conver	sions to po	h Unde	li .	ndition	W .	1			
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	$f_{HV}$	fp	v (pc/h)
$V_{FF}$	4437	0.90	8	0	1.5	1.2	0.962	1.00	5127
$V_{RF}$	743	0.90	8	0	1.5	1.2	0.962	1.00	859
$V_{FR}$	668	0.90	15	0	1.5	1.2	0.930	1.00	798
$V_{RR}$	112	0.90	15	0	1.5	1.2	0.930	1.00	134
$V_{NW}$	5261			-	V =			6918	
V <sub>W</sub>	1657							-	
VR	0.240								
Configu	ration Cha	aracteris	tics						
Minimum m	aneuver lanes, I	N <sub>WL</sub>		2 lc	Minimum weaving lane changes, LC <sub>MIN</sub> 1657				1657 lc/h
Interchange	e density, ID			0.8 int/mi	Weaving lane changes, LC <sub>W</sub> 2010				2010 lc/h
Minimum R	F lane changes,	$LC_RF$		1 lc/pc	Non-weaving lane changes, LC <sub>NW</sub> 115			1153 lc/h	
Minimum F	R lane changes,	$LC_{FR}$		1 lc/pc	Total lane ch	nanges, LC <sub>ALI</sub>			3163 lc/h
Minimum R	R lane changes,	$LC_{RR}$		lc/pc					652
Weavin	g Segment	Speed,	Density, I	_evel of	Service,	and Cap	acity		
Weaving se	egment flow rate	, V		6918 pc/h	Weaving inte	ensity factor,	W		0.397
			7846 veh/h	Weaving segment speed, S 41			41.3 mph		
Weaving segment v/c ratio 0.848			0.848	Average weaving and C			47.2 mph		
Weaving segment density, D 41.8 pc/mi/ln				•	Average non-weaving speed, $S_{\rm NW}$			39.8 mph	
Level of Service, LOS E				E	Maximum weaving length, L <sub>MAX</sub> 4944			4944 f	
Notes									
Chapter 13, '	egments longer the 'Freeway Merge a es that exceed the	and Diverge Se e weaving segr	gments".	· ·		solated merge	and diverge are	eas using the	procedures of

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			REEWAY	WEAV	0		T		
General Information				Site Information					
Analyst AJR Agency/Company Atkins Date Performed 3/20/2014 Analysis Time Period PM Peak					Freeway/Dir of Travel I-26 EB Weaving Segment Location 1100 - I-526 CD to Montague SB Analysis Year 2038 Build - River Center Site				
Project Desc Inputs	cription Navy Ba	ase ICTF							
Weaving seg Freeway free	mber of lanes, N gment length, L <sub>s</sub> e-flow speed, FF	S FS		1550ft 60 mph	Segment typ Freeway min Freeway max Terrain type	imum speed,			Freewa 1: 230 Leve
Convers	sions to po	/h Unde	r Base Co	ndition	5	1			
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	$f_{HV}$	fp	v (pc/h)
$V_{FF}$	2624	0.90	6	0	1.5	1.2	0.971	1.00	3003
$V_{RF}$	608	0.90	6	0	1.5	1.2	0.971	1.00	696
$V_{FR}$	972	0.90	8	0	1.5	1.2	0.962	1.00	1123
$V_{RR}$	226	0.90	8	0	1.5	1.2	0.962	1.00	261
V <sub>NW</sub>	3264		•				•	V =	5083
V <sub>W</sub>	1819							•	
VR	0.358								
Configu	ration Cha	aracterist	tics						
Minimum m	aneuver lanes, I	N <sub>WL</sub>		2 lc	Minimum we	aving lane ch	nanges, LC <sub>MIN</sub>		1819 lc/h
Interchange	density, ID			0.8 int/mi	Weaving lane changes, LC <sub>w</sub> 2172 l				2172 lc/h
Minimum RI	F lane changes,	$LC_RF$		1 lc/pc	Non-weaving lane changes, LC <sub>NW</sub> 74			742 lc/h	
Minimum FF	R lane changes,	$LC_FR$		1 lc/pc	Total lane changes, LC <sub>ALL</sub> 291				2914 lc/h
Minimum RI	R lane changes,	LC <sub>RR</sub>		lc/pc	·				405
Weaving	g Segment	Speed,	Density, I	evel of	Service,	and Cap	acity		
Weaving se	gment flow rate,	, V		5083 pc/h				0.372	
Weaving segment capacity, c <sub>w</sub> 6511 veh/h			Weaving segment speed, S 43.			43.1 mph			
Weaving segment v/c ratio 0.758					Average weaving speed, S <sub>W</sub> 47			47.8 mph	
Weaving segment density, D 29.5 pc/mi/ln					Average non-weaving speed, $S_{NW}$			40.8 mph	
Level of Service, LOS D Maximum weaving length, L <sub>MAX</sub>							6213 ff		
Notes									
Chapter 13, "	egments longer the Freeway Merge a es that exceed the	and Diverge Se	gments".			solated merge	and diverge are	eas using the	procedures of

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>I-26 EB</i>	
Agency or Company	Atkins		From/To	1105-M	ont SB Off to Mont
Date Performed	7/25/2014		Jurisdiction	SB On	
Analysis Time Period	AM Peak		Analysis Year	2038 Bu Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	5180	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 8	
Peak-Hr Prop. of AADT, K		,	%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments		·		
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
Γ E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$		
Speed Inputs	7.0		Calc Speed Adj and		
Lane Width		ft	Caic Speeu Auj anu	113	
Rt-Side Lat. Clearance		ft			
Number of Lanes, N	3	11	f <sub>LW</sub>		mph
	3		f <sub>LC</sub>		mph
Total Ramp Density, TRD	00.0	ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performanc	e Measures		Design (N)		
			Design (N)		
Operational (LOS)			Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub> 1995	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>in</sub> ,	
x f <sub>p</sub> )		F -	$x f_p$	п۷	pc/h/ln
S	57.2	mph	s p'		mph
$D = v_p / S$	34.9	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	D		Required Number of Lanes	s. N	ролими
Glossary			Factor Location	•	
N - Number of lanes	S - Spee	ed			
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>n</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18		TRD - Page 11-11
speed			LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	
DDHV - Directional design	hour volume		11-3		
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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>I-26 EB</i>	
Agency or Company	Atkins		From/To	1105-M SB On	ont SB Off to Mont
Date Performed	7/25/2014		Jurisdiction		
Analysis Time Period	PM Peak		Analysis Year	2038 Βι Site	ıild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	3232	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 6	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length	Level mi	
			Up/Down %		
Calculate Flow Adjus	tments				
f <sub>p</sub>	1.00		$E_R$	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] <i>0.971</i>	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	3		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			·
LOS and Performanc	e Measures	3	Design (N)		
			Design (N)		
Operational (LOS)	NIf		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x I)$	N X <sup>†</sup> HV 1233	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	
x f <sub>p</sub> )	60.0	ma m la	$x^{r}f_{p}$ )		pc/h/ln
S	60.0	mph	s		mph
D = v <sub>p</sub> / S LOS	20.5 C	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LO3	C		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed	E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens	sity	$E_{\rm T}$ - Exhibits 11-10, 11-11,		f <sub>LC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate	FFS - Free	e-flow speed	$f_{\rm n}$ - Page 11-18		TRD - Page 11-1
LOS - Level of service	BFFS - Ba	ase free-flow	LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2	IND - Fage 11-1
speed DDHV - Directional design	hour volume		11-3	11-4,	
DDITY - Directional design	noui voidine				

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			REEWA	WEAV	NG WOF	RKSHEE	T		
General Information					Site Information				
Analyst AJR Agency/Company Atkins Date Performed 7/25/2014 Analysis Time Period AM Peak  Project Description Navy Base ICTF					Freeway/Dir Weaving Seç Analysis Yea	gment Location			SB to Mont. NE Center Site
Inputs									
Weaving seg Freeway free	mber of lanes, Ngment length, Lge-flow speed, F	s FS		4 470ft 60 mph	Segment typ Freeway min Freeway max Terrain type	imum speed			Freeway 19 2300 Leve
Convers	sions to po	c/h Unde	r Base Co	ndition	5				
	V (veh/h)	PHF	Truck (%)	RV (%)	Ε <sub>T</sub>	E <sub>R</sub>	$f_{HV}$	fp	v (pc/h)
$V_{FF}$	4664	0.90	8	0	1.5	1.2	0.962	1.00	5390
$V_{RF}$	422	0.90	9	0	1.5	1.2	0.957	1.00	490
$V_{FR}$	516	0.90	6	0	1.5	1.2	0.971	1.00	591
$V_{RR}$	0	0.90	0	0	1.5	1.2	1.000	1.00	0
V <sub>NW</sub>	5390							V =	6471
$V_W$	1081								
VR	0.167								
Configu	ration Ch	aracteris	tics						
Minimum m	aneuver lanes,	N <sub>WL</sub>		2 lc	Minimum weaving lane changes, LC <sub>MIN</sub> 1081 lc				1081 lc/h
Interchange	density, ID			1.0 int/mi	Weaving lane changes, LC <sub>w</sub> 1223 lc				1223 lc/h
Minimum RI	F lane changes	, LC <sub>RF</sub>		1 lc/pc	Non-weaving lane changes, LC <sub>NW</sub> 595			595 lc/h	
Minimum FF	R lane changes	, LC <sub>FR</sub>		1 lc/pc	Total lane changes, LC <sub>ALL</sub> 1818 lo				1818 lc/h
Minimum RI	R lane changes	, LC <sub>RR</sub>		lc/pc	Non-weaving	g vehicle inde	ex, I <sub>NW</sub>		253
Weaving	g Segmen	t Speed,	Density, l	Level of	Service,	and Cap	oacity		
Weaving se	gment flow rate	, V		6471 pc/h		ensity factor,			0.657
Weaving segment capacity, c <sub>w</sub> 7746 veh/h							44.1 mph		
Weaving segment v/c ratio 0.803					"			42.2 mph	
Weaving segment density, D 36.7 pc/mi/ln Level of Service, LOS E					****			44.5 mph	
	VICE, LOS			E	Maximum we	eaving length	ı, L <sub>MAX</sub>		4202 ft
Notes a. Weaving se	egments longer t	han the calcula	ited maximum le	ength should I	oe treated as is	solated merge	and diverge ar	eas using the	procedures of
	Freeway Merge a es that exceed the			ne level of se	vice is "F".				

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			REEWAY	WEAV	1		T		
Genera	l Information	on			Site Information				
Analyst AJR Agency/Company Atkins Date Performed 7/25/2014 Analysis Time Period PM Peak					Freeway/Dir Weaving Seg Analysis Yea	gment Location			GB to Mont. NB Center Site
Inputs	cription Navy Ba	ase io ir							
Weaving configuration  Weaving number of lanes, N  Weaving segment length, L <sub>S</sub> One-Sided  470ft				470ft 60 mph	Segment typ Freeway min Freeway maz Terrain type	imum speed			Freeway 15 2300 Leve
Conver	sions to po	T .	r Base Co	T .	T .	1	1	1	1
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	ER	f <sub>HV</sub>	fp	v (pc/h)
$V_{FF}$	2946	0.90	6	0	1.5	1.2	0.971	1.00	3372
$V_{RF}$	535	0.90	6	0	1.5	1.2	0.971	1.00	612
$V_{FR}$	286	0.90	9	0	1.5	1.2	0.957	1.00	332
$V_{RR}$	0	0.90	0	0	1.5	1.2	1.000	1.00	0
$V_{NW}$	3372			-		_		V =	4316
$V_{W}$	944								
VR	0.219								
Configu	uration Cha	aracteris	tics						
Minimum n	naneuver lanes, I	N <sub>WL</sub>		2 lc	Minimum we	aving lane cl	hanges, LC <sub>MIN</sub>		944 lc/h
Interchange	e density, ID			1.0 int/mi	Weaving lane changes, LC <sub>w</sub> 1086 lc/h				
Minimum R	RF lane changes,	$LC_{RF}$		1 lc/pc	Non-weaving lane changes, LC <sub>NW</sub> 179			179 lc/h	
Minimum F	R lane changes,	$LC_{FR}$		1 lc/pc	Total lane ch	nanges, LC <sub>AL</sub>	L		1265 lc/h
Minimum R	RR lane changes,	, LC <sub>RR</sub>		lc/pc	Non-weaving	g vehicle inde	ex, I <sub>NW</sub>		158
Weavin	g Segment	t Speed,	Density, I	Level of	Service,	and Cap	pacity		
Weaving segment flow rate, v 4316 pc/h Weaving segment capacity, c <sub>w</sub> 7666 veh/h			Weaving intensity factor, W Weaving segment speed, S 47.4			0.494 47.4 mph			
Weaving segment v/c ratio 0.547					"			45.1 mph	
Weaving segment density, D 22.8 pc/mi/ln								48.0 mph	
	Level of Service, LOS C Maximum weaving length, L <sub>MAX</sub> 4728							4/28 ft	
Chapter 13,	segments longer the "Freeway Merge a es that exceed the	and Diverge Se	gments".			solated merge	and diverge ar	eas using the	procedures of

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	1115-Mo NB On	ont NB Off to Mont
Date Performed	4/25/2014		Jurisdiction	ND OII	
Analysis Time Period	AM Peak		Analysis Year	2038 Bu Site	ild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	☐ Plar	ning Data
Flow Inputs					
Volume, V AADT	5086	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 8	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length	Level mi	
			Up/Down %		
Calculate Flow Adjus	tments				
$f_p$	1.00		$E_R$	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] 0.962	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	3		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			,
LOS and Performanc	e Measures	3	Design (N)		
Operational (LOC)			Design (N)		
Operational (LOS)	N v f		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x   v_f)$	1959	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	$N \times f_{HV}$	pc/h/ln
x f <sub>p</sub> ) S	57.7	mnh	x f <sub>p</sub> )		рс/п/п
	34.0	mph	S		mph
D = v <sub>p</sub> / S LOS	54.0 D	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LO3	D		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed	E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens	sity	$E_{\rm T}$ - Exhibits 11-10, 11-11,		f <sub>LC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate	FFS - Free	e-flow speed	$f_{\rm n}$ - Page 11-18	10	TRD - Page 11-1
LOS - Level of service	BFFS - Ba	ase free-flow	LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2	IND - Fage 11-1
speed	hour volume		11-3	11-4,	
DDHV - Directional design	nour voluttie				

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	1115-Mo NB On	ont NB Off to Mont
Date Performed	7/25/2014		Jurisdiction	NB OII	
Analysis Time Period	PM Peak		Analysis Year	2038 Bu Site	ıild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			es.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	3481	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 6	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length	Level mi	
			Up/Down %		
Calculate Flow Adjus	tments				
f <sub>p</sub>	1.00		$E_R$	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.971	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	3		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performanc	e Measures	3	Design (N)		
			Design (N)		
Operational (LOS)	M f		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x I)$	N X <sup>†</sup> HV 1328	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	
x f <sub>p</sub> )			$x f_p$ )	110	pc/h/ln
S	60.0	mph	s		mph
$D = v_p / S$	22.1	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	С		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed			f Evhihit 11 0
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>p</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18	11 2	TRD - Page 11-1
speed	haur vale		LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-∠,	
DDHV - Directional design	nour volume		1113		

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		RAI	MPS AND	RAMP JUN	<u>CTIONS W</u>	<u>ORKSH</u>	<u>EET</u>				
Genera	Infori	nation			Site Infor	mation					
Analyst		AJR		Fi	reeway/Dir of Tr	avel	I-26 EB				
Agency or C	, ,	Atkin			unction		1120 - EB	On from Montague N	NB		
Date Perfor		7/25/			urisdiction						
Analysis Tin				A	nalysis Year		2038 Build	- River Center Site			
	cription	Navy Base ICT	l <del>l</del>								
Inputs			EN	hanafi anaa Ni							
Jpstream A	dj Ramp		1 '	ber of Lanes, N	3				Downstr	eam Adj	
Yes	On		Ramp Number		1				Ramp		
⊔ Yes	□On		Acceleration L	ane Length, L <sub>A</sub>	850				☐Yes	On	
☑ No	Off		Deceleration L	ane Length L <sub>D</sub>					✓ No	Off	
			Freeway Volum	ne, V <sub>F</sub>	5086				I NO		
=	ft		Ramp Volume	, V <sub>R</sub>	719				L <sub>down</sub> =	ft	
			1	Flow Speed, S <sub>FF</sub>	60.0						
/ <sub>u</sub> =	veh/h		1	ow Speed, S <sub>FR</sub>	45.0				$V_D =$	veh/h	
Convor	oion to	no/h Hn		111	43.0						
Jonvers	ווייטוו נכ	<del>γ ρε/π οπο</del> ∀		Conditions		1					
(pc/l	h)	(Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	f <sub>p</sub>	v = V/PF	$IF \ x \ f_HV \ x \ f_p$	
Freeway		5086	0.90	Level	8	0	0.962		1	5877	
Ramp		719	0.90	Level	8	0	0.962			831	
UpStream											
DownStrea	m										
			Merge Areas					Diverge Area	s		
Estimation of v <sub>12</sub>							ion of v	12			
		V <sub>12</sub> = V <sub>F</sub>	( P <sub>EM</sub> )					/ <sub>12</sub> = V <sub>R</sub> + (V <sub>F</sub> - \	/ \D		
- <sub>EQ</sub> =			ation 13-6 or	13-7)		_	,			40)	
P <sub>FM</sub> =				ion (Exhibit 13-6)	١	L <sub>EQ</sub> =		(Equation 1			
/ <sub>12</sub> =		3534		IOTT (EXTIIDIT TO 0	/	P <sub>FD</sub> =		using Equa	tion (Exhibit	13-7)	
				on 13-14 or 13-	_	V <sub>12</sub> =		pc/h			
$V_3$ or $V_{av34}$		17)	pom (Equalic	JII 13-14 OI 13-		V <sub>3</sub> or V <sub>av34</sub>		pc/h (Equatio		-17)	
Is V <sub>3</sub> or V <sub>av</sub>	,34 > 2,700	) pc/h? Ye:	s 🗹 No			Is V <sub>3</sub> or V <sub>av</sub>	<sub>34</sub> > 2,700 p	oc/h? 🗌 Yes 🔲 N	lo		
		V <sub>12</sub> /2  Ye				Is V <sub>3</sub> or V <sub>av</sub>	<sub>34</sub> > 1.5 * V	<sub>12</sub> /2 □Yes □N	lo		
				-16, 13-18, or		If Yes,V <sub>12a</sub> =	=	pc/h (Equa	tion 13-16,	13-18, or	
f Yes,V <sub>12a</sub> :		13-19)						13-19)			
Capacit	y Che	cks				Capacit	y Checl	ks			
		Actual	C	apacity	LOS F?		,	Actual (	Capacity	LOS F?	
						$V_{F}$		Exhibit 1	3-8		
V <sub>F</sub>	_	6708	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>	Exhibit 1	3-8		
- F(	0	0700	Extribit 10 0		110			Exhibit 1	13-		
						V <sub>R</sub>		10			
Flow Er	ntering	Merge In	fluence A			Flow En	tering l	Diverge Influe			
		Actual	Max	Desirable	Violation?		Actu	al Max D	esirable	Violation?	
$V_{R1}$		4365	Exhibit 13-8	4600:AII	No	V <sub>12</sub>		Exhibit 13-8	3		
_evel o	f Servi	ce Detern	nination (i	f not F)		Level of	Servic	e Determinat	ion (if no	t F)	
D <sub>R</sub> =	5.475 +	0.00734 v <sub>R</sub> + 0	0.0078 V <sub>12</sub> - 0.0	00627 L <sub>A</sub>			D <sub>R</sub> = 4.25	52 + 0.0086 V <sub>12</sub> -	0.009 L <sub>D</sub>		
) <sub>R</sub> = 3:	3.8 (pc/mi	/ln)				D <sub>R</sub> = (p	oc/mi/ln)		_		
	(Exhibit 1					1	Exhibit 13	-2)			
	,	,				`					
_	peed Determination					Speed Determination					
•							Exhibit 13-12	•			
$S_R = 5$	0.1 mph (	Exhibit 13-11)				l ''	ph (Exhibit				
$S_0 = 5$	3.2 mph (	Exhibit 13-11)				$S_0 = m$	ph (Exhibit	13-12)			
	1.1 mph (	Exhibit 13-13)				S = m	ph (Exhibit	13-13)			
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			MPS AND	RAMP JUN			EET				
Genera	I Infori	mation			Site Infor	mation					
Analyst		AJR		Fr	eeway/Dir of Tr	avel	I-26 EB				
gency or C	, ,	Atkin			ınction		1120 - EB (	On from Montague N	lB		
ate Perfor		4/25/			ırisdiction						
nalysis Tin				Ai	nalysis Year		2038 Build	- River Center Site			
roject Des <b>nputs</b>	cription	Navy Base ICT	lF								
•			Fraguesy Num	ber of Lanes, N	2						
Ipstream A	dj Ramp		1 '		3				Downstr	eam Adj	
Yes	On		Ramp Number		1				Ramp		
_ 168			1	ane Length, L <sub>A</sub>	850				☐Yes	On	
☑ No	☐ Off		Deceleration L	ane Length L <sub>D</sub>					✓ No	Off	
			Freeway Volui	me, V <sub>F</sub>	3481				I NO		
<sub>.p</sub> =	ft		Ramp Volume	, V <sub>R</sub>	779				L <sub>down</sub> =	ft	
			1	Flow Speed, S <sub>FF</sub>	60.0				.,		
' <sub>u</sub> =	veh/h		1	ow Speed, S <sub>FR</sub>	45.0				V <sub>D</sub> =	veh/h	
`onvor	cion to	nc/h Hn/		Conditions	70.0						
		<i>γ ρε/π οπ</i>					1 .				
(pc/l	h)	(Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	f <sub>p</sub>	v = V/PH	$IF \ x \ f_HV \ x \ f_p$	
reeway		3481	0.90	Level	6	0	0.971	1.00		3984	
Ramp		779	0.90	Level	7	0	0.966	1.00		896	
JpStream											
ownStrea	m										
			Merge Areas					Diverge Areas	5		
Estimation of v <sub>12</sub>							ion of v	12			
		V <sub>12</sub> = V <sub>F</sub>	( P <sub>EM</sub> )				\	/ <sub>12</sub> = V <sub>R</sub> + (V <sub>F</sub> - \	/ \D		
EQ =			ation 13-6 or	13-7)		_	v			40)	
FM =				ion (Exhibit 13-6)	1	L <sub>EQ</sub> =		(Equation 1			
12 =		2396		IOTT (EXTILOR TO 0)	1	P <sub>FD</sub> =		using Equa	tion (Exhibit	13-7)	
				on 13-14 or 13-		V <sub>12</sub> =		pc/h			
or V <sub>av34</sub>		17)	pc/ii (Equalic	)   13-14 0  13-	'	V <sub>3</sub> or V <sub>av34</sub>		pc/h (Equation		-17)	
s V <sub>3</sub> or V <sub>3</sub>	,34 > 2,700	) pc/h? Ye:	s 🗸 No			Is V <sub>3</sub> or V <sub>av</sub>	<sub>34</sub> > 2,700 p	c/h? □Yes □N	lo		
		V <sub>12</sub> /2 ☐ Ye				Is V <sub>3</sub> or V <sub>av</sub>	<sub>34</sub> > 1.5 * V <sub>1</sub>	<sub>2</sub> /2 □Yes □N	lo		
				3-16, 13-18, or		If Yes,V <sub>12a</sub> =	:	pc/h (Equat	ion 13-16,	13-18, or	
Yes,V <sub>12a</sub>		13-19)				12a		13-19)			
Capacit	ty Che	cks				Capacit	y Check	rs			
		Actual	C	apacity	LOS F?		P	Actual (	Capacity	LOS F?	
						V <sub>F</sub>		Exhibit 1	3-8		
V <sub>F</sub>		4880	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>	Exhibit 1	3-8		
*F	0	4000	EXHIBIT 10-0		140			Exhibit 1	13-		
						V <sub>R</sub>		10			
low Er	ntering	Merge In	fluence A	rea		Flow En	tering L	Diverge Influe	ence Area	а	
		Actual	Max I	Desirable	Violation?		Actua	al Max D	esirable	Violation	
$V_{R1}$	2	3292	Exhibit 13-8	4600:AII	No	V <sub>12</sub>		Exhibit 13-8	3		
evel o	f Servi	ce Detern	nination (i	f not F)		Level of	Service	e Determinati	ion (if no	t F)	
D <sub>R</sub> =	5.475 +	0.00734 v <sub>R</sub> + 0	0.0078 V <sub>12</sub> - 0.0	00627 L <sub>A</sub>			D <sub>R</sub> = 4.25	2 + 0.0086 V <sub>12</sub> -	0.009 L <sub>D</sub>		
	5.4 (pc/mi					L	c/mi/ln)	12	5		
	(Exhibit 1					1	Exhibit 13-	.2)			
	,					`					
_	peed Determination					Speed Determination					
I <sub>S</sub> = 0	3 = 0.349 (Exibit 13-11)					,	xhibit 13-12	•			
R= 5	3.7 mph (	Exhibit 13-11)				l ''	ph (Exhibit '				
<sub>0</sub> = 50	6.1 mph (	Exhibit 13-11)				$S_0 = m$	ph (Exhibit '	13-12)			
	4.5 mph (	Exhibit 13-13)				S = m	ph (Exhibit	13-13)			
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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>I-26 EB</i>	
Agency or Company	Atkins		From/To	1130 - N	Montague to
Date Performed	7/25/2014		Jurisdiction	Dorches	ster
Analysis Time Period	AM Peak		Analysis Year	2038 Βι Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			es.(N)	☐ Plar	nning Data
Flow Inputs					
Volume, V AADT	5805	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 7	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments				
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] 0.966	
Speed Inputs			Calc Speed Adj and		
Lane Width		ft	у проседне		
Rt-Side Lat. Clearance		ft	f		mnh
Number of Lanes, N	3		f <sub>LW</sub>		mph
Total Ramp Density, TRD		ramps/mi	f <sub>LC</sub>		mph
FFS (measured)	60.0	mph	TRD Adjustment		mph
Base free-flow Speed,	00.0	•	FFS	60.0	mph
BFFS		mph			
LOS and Performanc	e Measures	5	Design (N)		
On a ration at (1,00)			Design (N)		
Operational (LOS)	NI v. f		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x)$	N X I <sub>HV</sub> 2225	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	0.0
x f <sub>p</sub> )	50.0		$x f_p$ )		pc/h/ln
5	52.9	mph	s		mph
$D = v_p / S$	42.1	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	E		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed			f
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>n</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18	44.0	TRD - Page 11-11
speed			LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	
DDHV - Directional design	hour volume		11-3		
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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т					
General Information			Site Information						
Analyst	AJR		Highway/Direction of Trave						
Agency or Company	Atkins		From/To	1130 - N Dorches	Montague to				
Date Performed	7/25/2014		Jurisdiction						
Analysis Time Period	PM Peak		Analysis Year	2038 Bu Site	uild - River Center				
Project Description Navy	Base ICTF								
✓ Oper.(LOS)			Des.(N)	Plar	nning Data				
Flow Inputs									
Volume, V	4260	veh/h	Peak-Hour Factor, PHF	0.90					
AADT		veh/day	%Trucks and Buses, P <sub>T</sub>	6					
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0					
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length	Level mi					
DDHV - AADTXKXD		Venin	Grade % Length Up/Down %	1111					
Calculate Flow Adjus	tments								
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2					
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	I)] <i>0.971</i>					
Speed Inputs			Calc Speed Adj and	FFS					
Lane Width		ft							
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph				
Number of Lanes, N	3		f <sub>LC</sub>		mph				
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph				
FFS (measured)	60.0	mph	FFS	60.0	mph				
Base free-flow Speed,		mph		00.0	Шрп				
BFFS LOS and Performanc	o Moasuros	<u> </u>	Design (N)						
LOO and I enormand	e incasure:	<u> </u>							
Operational (LOS)			Design I OS						
$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub> 4605	n o /lo /lo	Design LOS	N v f					
x f <sub>p</sub> )	1625	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	IN X I <sub>HV</sub>	pc/h/ln				
S	60.0	mph	x f <sub>p</sub> )						
$D = v_p / S$	27.1	pc/mi/ln	S		mph				
LOS	D		$D = v_p / S$	- NI	pc/mi/ln				
Classen			Required Number of Lanes	5, IN					
Glossary	S Snor		Factor Location						
N - Number of lanes	S - Spee		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8				
V - Hourly volume	D - Dens	-	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9				
v <sub>p</sub> - Flow rate LOS - Level of service		e-flow speed ase free-flow	f <sub>p</sub> - Page 11-18		TRD - Page 11-1				
speed	טררס - ספ	ase Hee-How	LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,					
DDHV - Directional design	hour volume		11-3						
			1						

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		RAMP	S AND RAM	IP JUNCTI	ONS WO	RKS	HEET				
General Info	rmation	10 001	<u> </u>	Site Infor							
Analyst Agency or Company	AJR	s		reeway/Dir of Tr unction	avel	I-26 EE		rchester Rd			
Date Performed	7/25/	2014		urisdiction							
Analysis Time Perio			A	nalysis Year		2038 B	uild - River	Center Site			
Project Description	Navy Base ICT	ΓF									
Inputs		1						-			
Upstream Adj F	Ramp	Freeway Num Ramp Numbe	ber of Lanes, N or of Lanes, N	3 1					Downstrea Ramp	m Adj	
	On	1	ane Length, L <sub>A</sub>	200					□Yes	On	
☑ No	Off	Freeway Volu	Lane Length L <sub>D</sub>	380 5805					✓ No	Off	
L <sub>up</sub> =	ft	Ramp Volume		565					L <sub>down</sub> =	ft	
V,, = v	reh/h	Freeway Free	-Flow Speed, S <sub>FF</sub>	60.0				,	V <sub>D</sub> =	veh/h	
v <sub>u</sub> – v	en/n	Ramp Free-Fl	ow Speed, S <sub>FR</sub>	45.0					ъ	701111	
Conversion t	o pc/h Und	der Base	Conditions					-			
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	f <sub>p</sub>	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>	
Freeway	5805	0.90	Level	7	0	0.	966	1.00	66	76	
Ramp	565	0.90	Level	12	0	0.	943	1.00	66	5	
UpStream		$\vdash$				-					
DownStream		I I Merge Areas					<u>I</u>	iverge Areas			
Estimation o		Estimati	ion o		Tronge / Hous						
		(D)						\/ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	\D		
	$V_{12} = V_F$	1 101	40.7)		_			$V_R + (V_F - V_R)$			
L <sub>EQ</sub> =		ition 13-6 or			L <sub>EQ</sub> =		•	Equation 13-1			
P <sub>FM</sub> =	_	Equation (	=XNIDIT 13-6)		P <sub>FD</sub> =			563 using Equ	iation (Exhib	oit 13-7)	
V <sub>12</sub> =	pc/h	F '' 40	44 40 47)		V <sub>12</sub> =			46 pc/h		40.4=\	
V <sub>3</sub> or V <sub>av34</sub>			-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>	. 0.7		30 pc/h (Equa	ation 13-14	or 13-17)	
Is $V_3$ or $V_{av34} > 2,70$								Yes ☑ No			
Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 If Yes,V <sub>12a</sub> =	pc/h (	Equation 13	-16, 13-18, or		Is $V_3$ or $V_{av34} > 1.5 * V_{12}/2$ Yes No pc/h (Equation 13-16, 13-18, or 13						
	13-19)	)			19)						
Capacity Che	ecks				Capacity	y Ch	ecks				
	Actual	C	apacity	LOS F?			Actual		pacity	LOS F?	
					V <sub>F</sub>		6676	Exhibit 13-8	6900	No	
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$	- V <sub>R</sub>	6011	Exhibit 13-8	6900	No	
					$V_R$		665	Exhibit 13-10	2100	No	
Flow Enterin	g Merge In	fluence A	rea		Flow En	terin	g Diver	ge Influenc	ce Area		
	Actual		Desirable	Violation?		/	Actual	Max Desirab	le	Violation?	
V <sub>R12</sub>		Exhibit 13-8			V <sub>12</sub>		1046	Exhibit 13-8	4400:All	No	
Level of Serv					Level of	Serv	ice De	terminatior	n (if not l	=)	
$D_R = 5.475 + 0$	.00734 v <sub>R</sub> +	0.0078 V <sub>12</sub> -	- 0.00627 L <sub>A</sub>		1	$D_R = 4$	.252 + 0.	0086 V <sub>12</sub> - 0.0	009 L <sub>D</sub>		
D <sub>R</sub> = (pc/mi/lr	1)				$D_R = 35$	5.6 (pc	/mi/ln)				
LOS = (Exhibit	13-2)				LOS = E	(Exhib	oit 13-2)				
Speed Deteri	mination				Speed D	`		n			
M <sub>S</sub> = (Exibit 1	3-11)				D <sub>s</sub> = 0.358 (Exhibit 13-12)						
l ''	nibit 13-11)				S <sub>R</sub> = 53.6 mph (Exhibit 13-12)						
	nibit 13-11)				S <sub>0</sub> = 59.5 mph (Exhibit 13-12)						
, ,	nibit 13-13)				S = 55	5.7 mph	(Exhibit	13-13)			
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		RAMP	S AND RAN	IP JUNCTI	ONS WO	RKS	HEET				
General Info	ormation			Site Infor			·				
Analyst	AJR		F	reeway/Dir of Tr	avel	I-26 EE	}				
Agency or Compar	ny Atkin	S		unction		1140-E	B Off to D	orchester Rd			
Date Performed	7/25/			urisdiction							
Analysis Time Peri			A	nalysis Year		2038 B	uild - Rive	r Center Site			
Project Description Inputs	Navy Base IC	l F									
-		Freeway Num	ber of Lanes, N	3							
Upstream Adj	Ramp	Ramp Numbe							Downstrea Ramp	m Adj	
□Yes	On	I '	•	1					· ·		
		1	ane Length, L <sub>A</sub>	000					□Yes	On	
✓ No	Off	1	ane Length L <sub>D</sub>	380					<b>☑</b> No	Off	
	6	Freeway Volu		4260						ft	
L <sub>up</sub> =	ft	Ramp Volume	11	392					L <sub>down</sub> =	11	
V,, =	veh/h	1	-Flow Speed, $S_{FF}$	60.0					V <sub>D</sub> =	veh/h	
*u	VCII/II	Ramp Free-Fl	ow Speed, $S_{FR}$	45.0					D		
Conversion	to pc/h Und	der Base	Conditions								
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		$f_{HV}$	f <sub>p</sub>	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>	
Freeway	4260	0.90	Level	6	0	0.	971	1.00	48	75	
Ramp	392	0.90	Level	15	0	0.	930	1.00	46	8	
UpStream											
DownStream		M A									
Estimation of		Merge Areas			Estimat	ion o		Diverge Areas			
	<u></u>	<u> </u>			Lotimat	1011 0		\( \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	,,,		
	$V_{12} = V_{F}$	1 101						= V <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>	–		
_ <sub>EQ</sub> =		ation 13-6 or			L <sub>EQ</sub> =			Equation 13-1			
P <sub>FM</sub> =	_	Equation (	Exhibit 13-6)		P <sub>FD</sub> =			617 using Equ	uation (Exhib	oit 13-7)	
V <sub>12</sub> =	pc/h				V <sub>12</sub> =			185 pc/h			
$V_3$ or $V_{av34}$			-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>			690 pc/h (Equ	ation 13-14	or 13-17)	
Is $V_3$ or $V_{av34} > 2$ ,						• .		☐ Yes ☑ No			
Is $V_3$ or $V_{av34} > 1.5$					Is V <sub>3</sub> or V <sub>av</sub>	<sub>34</sub> > 1.5		☐Yes ☑ No			
If Yes,V <sub>12a</sub> =	pc/h ( 13-19)		-16, 13-18, or		If Yes,V <sub>12a</sub> =	=		oc/h (Equation 9)	13-16, 13-	18, or 13-	
Capacity Ch		/			Capacit	v Ch		<u> </u>			
Supacity Cit	Actual		apacity	LOS F?		<i>y 011</i>	Actual	Ca	pacity	LOS F?	
	1 10101011				V <sub>F</sub>		4875	Exhibit 13-8		No	
V <sub>FO</sub>		Exhibit 13-8			V <sub>FO</sub> = V <sub>F</sub>	V <sub>D</sub>	4407	Exhibit 13-8	-	No	
- FO		LXIIIDIL 10 0			V <sub>R</sub>	· · · R	468	Exhibit 13-1		No	
Class Entaris	na Maraa la	fluoroo A			- '`	40 11 11				INU	
Flow Enterii	Actual		Desirable	Violation?	FIOW EI	_	Actual	rge Influen  Max Desirab		Violation?	
V <sub>R12</sub>	Actual	Exhibit 13-8	ביים וו מטוכ	v iolation:	V <sub>12</sub>	$\overline{}$	3185	Exhibit 13-8	4400:All	No	
Level of Ser	vice Deter		if not El		<u> </u>			terminatio			
	0.00734 v <sub>R</sub> +							.0086 V <sub>12</sub> - 0.		/	
• •	• • •	0.0076 V <sub>12</sub> -	0.00021 LA					.0000 v <sub>12</sub> - 0.	ooa rD		
$D_R = (pc/mi/c)$	*				l .,		/mi/ln)				
LOS = (Exhibi					-	`	oit 13-2)				
Speed Deter					Speed L						
•	Exibit 13-11)					D <sub>s</sub> = 0.340 (Exhibit 13-12)					
S <sub>R</sub> = mph (Ex	xhibit 13-11)				S <sub>R</sub> = 53.9 mph (Exhibit 13-12)						
						S <sub>0</sub> = 63.1 mph (Exhibit 13-12)					
	xhibit 13-11)				$S_0 = 63$	3.1 mph	(Exhibit	13-12)			
$S_0 = mph (E)$	xhibit 13-11) xhibit 13-13)				l '	-	(Exhibit	•			

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed Analysis Time Period	AJR Atkins 7/25/2014 AM Peak		Highway/Direction of Trave From/To Jurisdiction Analysis Year	1145-Do Dorches 2038 Bu	orches Off to s On uild - River Center
Project Description Navy			. ,	Site	
✓ Oper.(LOS)	2400 70 77		Des.(N)	Plar	nning Data
Flow Inputs					g
Volume, V AADT Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D	5240	veh/h veh/day veh/h	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub> %RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0.90 7 0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub> E <sub>T</sub>	1.00 1.5		$E_R$ $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1.2 )] 0.966	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	3		$f_{LC}$		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured) Base free-flow Speed, BFFS	60.0	mph mph	FFS	60.0	mph
LOS and Performanc	e Measures	<del></del>	Design (N)		
Operational (LOS)  v <sub>p</sub> = (V or DDHV) / (PHF x   x f <sub>p</sub> ) S D = v <sub>p</sub> / S LOS	N x f <sub>HV</sub> 2009 57.0 35.3 E	pc/h/ln mph pc/mi/ln	Design (N) Design LOS $v_p = (V \text{ or DDHV}) / (PHF \text{ x} \text{ x } f_p)$ S $D = v_p / S$ Required Number of Lanes		pc/h/ln mph pc/mi/ln
Glossary			Factor Location	,	
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed DDHV - Directional design	BFFS - Ba		E <sub>R</sub> - Exhibits 11-10, 11-12 E <sub>T</sub> - Exhibits 11-10, 11-11, f <sub>p</sub> - Page 11-18 LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed Analysis Time Period	AJR Atkins 7/25/2014 PM Peak		Highway/Direction of Trave From/To Jurisdiction Analysis Year	1145-De Dorches	orches Off to
Project Description Navy	Base ICTF			Cito	
✓ Oper.(LOS)			Des.(N)	□Plar	nning Data
Flow Inputs					
Volume, V AADT Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D	3868	veh/h veh/day veh/h	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub> %RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0.90 6 0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub> E <sub>T</sub>	1.00 1.5		$E_R$ $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1.2 1)] 0.971	
Speed Inputs			Calc Speed Adj and		
Lane Width		ft	<u> </u>		
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	3		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured) Base free-flow Speed, BFFS	60.0	mph mph	FFS	60.0	mph
LOS and Performanc	e Measures	<u> </u>	Design (N)		
Operational (LOS)  v <sub>p</sub> = (V or DDHV) / (PHF x l x f <sub>p</sub> ) S D = v <sub>p</sub> / S LOS	N x f <sub>HV</sub> 1476 60.0 24.6 C	pc/h/ln mph pc/mi/ln	Design (N) Design LOS $v_p = (V \text{ or DDHV}) / (PHF \text{ x} \text{ x } f_p)$ S $D = v_p / S$ Required Number of Lanes		pc/h/ln mph pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed DDHV - Directional design	BFFS - Ba		$E_R$ - Exhibits 11-10, 11-12 $E_T$ - Exhibits 11-10, 11-11, $f_p$ - Page 11-18 LOS, S, FFS, $v_p$ - Exhibits 11-3	11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1

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		RAI	MPS AND	RAMP JUN	CTIONS W	ORKSHI	EET				
General In	nforr		• /	10 1111	Site Infor						
Analyst Agency or Com Date Performed	npany	AJR Atkins 7/25/2		Ju	eeway/Dir of Tr inction irisdiction	avel	I-26 E 1150 ·		n Dorchester		
Analysis Time F	Period	AM P			nalysis Year		2038	Build - River	Center Site		
Project Descript	tion	Navy Base ICT	F								
Inputs			1								
Upstream Adj R	Ramp		Freeway Num Ramp Numbe	ber of Lanes, N or of Lanes, N	3 1					Downstre Ramp	eam Adj
Yes	On		Acceleration L	ane Length, L <sub>A</sub>	560					✓ Yes	On
☑ No	Off		Deceleration I Freeway Volu	Lane Length L <sub>D</sub>	5240					□No	✓ Off
L <sub>up</sub> = f	ft		Ramp Volume		719					L <sub>down</sub> =	2100 ft
			1	Flow Speed, S <sub>FF</sub>	60.0						
$V_u = v$	/eh/h			low Speed, S <sub>FR</sub>	45.0					V <sub>D</sub> =	872 veh/h
Conversio	on to			Conditions	10.0						
(pc/h)		V	PHF	Terrain	%Truck	%Rv	$\Box$	f	f <sub>p</sub>	v = V/PH	F x f <sub>HV</sub> x f <sub>p</sub>
. ,		(Veh/hr)					+	f <sub>HV</sub>			· ·
Freeway		5240	0.90	Level	7	0	-	0.966	1.00		843
Ramp UpStream		719	0.90	Level	11	U	+	).948	1.00		043
DownStream		872	0.90	Level	12	0		).943	1.00		1027
		N	Merge Areas					C	Diverge Areas		-
Estimatio	n of	v <sub>12</sub>				Estimat	ion (	of v <sub>12</sub>			
		V <sub>12</sub> = V <sub>F</sub> (	(P <sub>FM</sub> )					\/ = '	V <sub>R</sub> + (V <sub>F</sub> - V <sub>R</sub>	/P	
L <sub>EQ</sub> =				13-6 or 13-7)		  =			Equation 13-		13)
P <sub>FM</sub> =				tion (Exhibit 13-6)		L <sub>EQ</sub> = P <sub>FD</sub> =			using Equation		
V <sub>12</sub> =		4081 p		,		V <sub>12</sub> =			oc/h	אוו (באוווטוניו	J-1)
V <sub>3</sub> or V <sub>av34</sub>		1945 p	oc/h (Equati	on 13-14 or 13-		V <sub>3</sub> or V <sub>av34</sub>			pc/h (Equation 1	13-14 or 13-	17)
	0.700	17)					., > 2		Yes No	10 11 01 10	,
Is $V_3$ or $V_{av34} >$									∃Yes □No		
Is V <sub>3</sub> or V <sub>av34</sub> > If Yes,V <sub>12a</sub> =	> 1.5 "			3-16, 13-18, or		If Yes,V <sub>12a</sub> =		1	oc/h (Equatio 3-19)	n 13-16, 1	13-18, or
Capacity (	Chec					Capacit	y Ch	ecks			
		Actual		Capacity	LOS F?			Actual	Са	pacity	LOS F?
						$V_{F}$			Exhibit 13-	8	
V <sub>FO</sub>		6869	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>		Exhibit 13-	8	
10						V <sub>R</sub>			Exhibit 13 10	-	
Flow Ente	ering	Merge In	fluence A	rea		Flow En	terii	ng Dive	rge Influer	ce Area	7
		Actual		Desirable	Violation?			Actual	Max Des	irable	Violation?
V <sub>R12</sub>		4924	Exhibit 13-8	4600:AII	Yes	V <sub>12</sub>			Exhibit 13-8		
Level of S						1			terminatio	-	t <b>F</b> )
		0.00734 v <sub>R</sub> + 0	0.0078 V <sub>12</sub> - 0.	00627 L <sub>A</sub>		'	D <sub>R</sub> =	4.252 + 0	.0086 V <sub>12</sub> - 0	.009 L <sub>D</sub>	
11	(pc/mi/	,					c/mi/	•			
	xhibit 1	<u> </u>				`		t 13-2)			
Speed Dea	term	ination				Speed L			on		
$M_{S} = 0.807$	7 (Exib	it 13-11)						13-12)			
S <sub>R</sub> = 45.5	mph (E	Exhibit 13-11)				I ''	ph (Ex	hibit 13-12)			
	mph (E	Exhibit 13-11)				$S_0 = m$	ph (Ex	hibit 13-12)			
	mph (E	Exhibit 13-13)				S = m	ph (Ex	hibit 13-13)			
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		RAI	MPS AND	RAMP JUN	CTIONS W	ORKSHI	EET				
General	I Infori		• /	10 1111	Site Infor						
Analyst Agency or C Date Perforr		AJR Atkins 4/25/2		Ju	eeway/Dir of Tranction	avel	I-26 E 1150 -	B - EB On from	n Dorchester		
Analysis Tin	me Period				nalysis Year		2038 E	Build - River	Center Site		
	cription	Navy Base ICT	F								
Inputs			ì							1	
Upstream A	dj Ramp		Freeway Num Ramp Numbe	ber of Lanes, N r of Lanes, N	3 1					Downstre Ramp	eam Adj
Yes	On		Acceleration L	ane Length, L <sub>A</sub>	560					✓ Yes	On
☑ No	☐ Off		Deceleration I Freeway Volu	_ane Length L <sub>D</sub> me_V_	3868					□No	<b>✓</b> Off
L <sub>up</sub> =	ft		Ramp Volume		554					L <sub>down</sub> =	2100 ft
			1	-Flow Speed, S <sub>FF</sub>	60.0						
V <sub>u</sub> =	veh/h			ow Speed, S <sub>FR</sub>	45.0					V <sub>D</sub> =	1253 veh/h
Conver	sion to			Conditions	40.0						
		\ \			0/ = 1	0/10		_	r	V/DII	
(pc/l	n)	(Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	f <sub>p</sub>	V = V/PH	F x f <sub>HV</sub> x f <sub>p</sub>
Freeway		3868	0.90	Level	6	0		.971	1.00		4427
Ramp		554	0.90	Level	13	0	0	.939	1.00		656
UpStream DownStream	ım	1253	0.90	Level	7	0		.966	1.00		1441
DOWNStream	1111		Merge Areas	Level	1	0			iverge Areas		1441
Estimation of v <sub>12</sub>						Estimat	ion d		g		
		V <sub>12</sub> = V <sub>F</sub> (	(P <sub>EM</sub> )						/ + /\/ \/	\D	
L <sub>EQ</sub> =				13-6 or 13-7)		_			$I_R + (V_F - V_R)$		12)
P <sub>FM</sub> =				ion (Exhibit 13-6)		L <sub>EQ</sub> =		,	Equation 13-		•
V <sub>12</sub> =		3227 p		(באווטוני וסיס)		P <sub>FD</sub> =			ising Equatio	on (Exnibit i	3-7)
				on 13-14 or 13-		V <sub>12</sub> =			oc/h	10 44 40	47)
V <sub>3</sub> or V <sub>av34</sub>		17)				V <sub>3</sub> or V <sub>av34</sub>	٠ ٠ ٠		oc/h (Equation 1	13-14 OF 13-	17)
		pc/h? Tyes							Yes No		
Is V <sub>3</sub> or V <sub>av</sub>	<sub>v34</sub> > 1.5 *	V <sub>12</sub> /2 ☐ Yes							]Yes	n 12 16 1	3 19 or
If Yes,V <sub>12a</sub> =	=	pc/h ( 13-19)	Equation 13	3-16, 13-18, or		If Yes,V <sub>12a</sub> =	:		8-19)	11 13-10,	13-10, UI
Capacit	tv Che					Capacit	v Ch	ecks			
	,	Actual		apacity	LOS F?	1		Actual	Car	pacity	LOS F?
				. ,		V <sub>F</sub>			Exhibit 13-	1	
V <sub>F</sub> (	_	5083	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>		Exhibit 13-	8	
FC	0	3000	EXHIBIT 10-0		No	V <sub>R</sub>			Exhibit 13-	-	
Flow Er	nterino	Merge In	fluence A	rea		Flow En	terii	na Diver	ge Influen	ce Area	<u> </u>
	1.09	Actual		Desirable	Violation?			Actual	Max Desi		Violation?
V <sub>R1</sub>	12	3883	Exhibit 13-8	4600:AII	No	V <sub>12</sub>			Exhibit 13-8		
		ce Detern	nination (	if not F)			Ser	vice De	terminatio	n (if no	: F)
		0.00734 v <sub>R</sub> + 0	•			1			0086 V <sub>12</sub> - 0	-	
$D_R = 3^{\circ}$	1.9 (pc/mi	/ln)	:=	• •			c/mi/		· <b>-</b>	_	
	Exhibit	13-2)					xhibi	t 13-2)			
Speed L	<u> </u>					Speed D			n		
_	.460 (Exit					1-1		13-12)			
ľ		Exhibit 13-11)						hibit 13-12)			
l ''						I ''		hibit 13-12)			
S = 5.											
ľ		Exhibit 13-11)				ľ		hibit 13-13)			

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General In	formation			Site Infor	mation								
Analyst	AJR		Fr	eeway/Dir of Tr		I-26 EE	3						
Agency or Com				inction			B Off to Co	sgrove SB					
Date Performed	' '	/2014	Ju	ırisdiction				.5					
Analysis Time P	Period AM I	Peak	Ar	nalysis Year		2038 B	uild - River	Center Site					
Project Descript	ion Navy Base IC	TF											
nputs													
Upstream A	Adi Pamp	Freeway Num	ber of Lanes, N	3					Downstre	am ∆di			
Opsilealii 7	Auj Mamp	Ramp Numbe	er of Lanes. N	1					Ramp	ani Aaj			
✓ Yes	✓ On	1 '	Lane Length, L <sub>Δ</sub>	•									
		1	,,	200					Yes	∐On			
☐ No	Off	1	Lane Length L <sub>D</sub>	200					✓ No	Off			
	0400 8	Freeway Volu	'	5959					ı =	ft			
L <sub>up</sub> =	2100 ft	Ramp Volume	11	872					L <sub>down</sub> =	IL			
\/ -	719 veh/h	Freeway Free	-Flow Speed, S <sub>FF</sub>	60.0					V <sub>D</sub> =	veh/h			
$V_u =$	719 Ven/m	Ramp Free-F	low Speed, S <sub>FR</sub>	45.0					, D	VO11/11			
Conversio	n to pc/h Un	der Base	Conditions										
(pc/h)	V	PHF	Terrain	%Truck	%Rv	$\top$	f I	f	v = V/DUC	x f <sub>HV</sub> x f <sub>p</sub>			
(pc/11)	(Veh/hr)	FUL	renam	/0 ITUCK	/0F\V	_	f <sub>HV</sub>	f <sub>p</sub>					
Freeway	5959	0.90	Level	7	0	0.	966	1.00	6	853			
Ramp	872	0.90	Level	12	0	0.	943	1.00	1	027			
UpStream	719	0.90	Level	11	0	0.	948	1.00	8	343			
DownStream													
		Merge Areas					Di	verge Areas					
Estimatior	n of v <sub>12</sub>				Estimat	ion o	f v <sub>12</sub>						
	V <sub>12</sub> = V <sub>F</sub>	( P <sub>EM</sub> )					V <sub>12</sub> =	V <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>	)P <sub>ED</sub>				
L <sub>EQ</sub> =	(Equa		L <sub>EQ</sub> =			98.84 (Equation		or 13-13)					
		Equation (I			P <sub>FD</sub> =			41 using Equ					
P <sub>FM</sub> =	_	Lquation (i	_XIIIDI( 15-0)						ומנוטוו (בגו	iibit 13-1)			
V <sub>12</sub> =	pc/h				V <sub>12</sub> =			31 pc/h					
$V_3$ or $V_{av34}$			-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>			'2 pc/h (Equa	ation 13-1	4 or 13-17			
	2,700 pc/h? TYe							Yes <b>☑</b> No					
Is $V_3$ or $V_{av34}$ >	1.5 * V <sub>12</sub> /2 Ye				Is V <sub>3</sub> or V <sub>av</sub>	<sub>34</sub> > 1.5	* V <sub>12</sub> /2	Yes ☑No					
If Yes,V <sub>12a</sub> =			-16, 13-18, or		If Yes,V <sub>12a</sub> =	=		h (Equation	13-16, 13	3-18, or 13-			
120	13-19	)			120		19	)					
Capacity (		1 .		1	Capacit	y Cn		1 0		1.00=			
	Actual		Capacity	LOS F?	,,		Actual		pacity	LOS F			
					V <sub>F</sub>		6853	Exhibit 13-8	6900	No			
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$	- V <sub>R</sub>	5826	Exhibit 13-8	6900	No			
					V <sub>R</sub>		1027	Exhibit 13-10	2100	No			
Flow Ente	ring Merge Ir	ofluence A	rea		Flow Er	terin	a Diver	ge Influen	ce Area				
TOW LINE	Actual		Desirable	Violation?	7.00.20	_	Actual	Max Desirab		Violation			
V <sub>R12</sub>		Exhibit 13-8			V <sub>12</sub>		1181	Exhibit 13-8	4400:All	No			
	ervice Deteri		if not E)					erminatio					
	+ 0.00734 v <sub>R</sub> +	•			1			0086 V <sub>12</sub> - 0.0	•	1)			
		0.0076 V <sub>12</sub>	0.00027 L <sub>A</sub>					1000 v <sub>12</sub> - 0.0	009 L <sub>D</sub>				
$D_{R} = (pc/n)$	ni/ln)				I .,	3.4 (pc	,						
_OS = (Exh	ibit 13-2)						oit 13-2)						
Speed Det	termination				Speed L	Deter	minatio	n					
<u> </u>	oit 13-11)				$D_s = 0$	390 (E	xhibit 13-	12)					
•	,				1			S <sub>R</sub> = 53.0 mph (Exhibit 13-12)					
M <sub>S</sub> = (Exit	(Eyhihit 13 11)				N <sub>D</sub> - 5.	יינוווו ט.כ							
$M_S = (Exiton)$ $S_R = mph ($	(Exhibit 13-11)				1								
$M_S = (Exit)$ $S_R = mph (S_0 =$	(Exhibit 13-11) (Exhibit 13-11) (Exhibit 13-13)				S <sub>0</sub> = 59	9.3 mph	(Exhibit 1 (Exhibit 1	3-12)					

F-4319

	formation			Site Infor	mation					
Analyst	AJR		Fr	reeway/Dir of Tr		I-26 EE	3			
Agency or Comp				unction			B Off to Cos	grove SB		
Date Performed	7/25/	/2014	Jı	urisdiction			`			
Analysis Time P	eriod PM F	<sup>o</sup> eak	A	nalysis Year		2038 B	uild - River C	enter Site		
	ion Navy Base IC	ΓF								
Inputs										
Upstream A	Adj Ramp	Freeway Num Ramp Numbe	nber of Lanes, N	3					Downstre Ramp	am Adj
✓Yes	<b>☑</b> On	1 '	Lane Length, L <sub>A</sub>	'					Yes	□On
□No	Off	Deceleration	Lane Length L <sub>D</sub>	200					☑ No	Off
		Freeway Volu	ıme, V <sub>F</sub>	4422						_
L <sub>up</sub> =	2100 ft	Ramp Volume	11	1253					L <sub>down</sub> =	ft
V,, =	554 veh/h	1	e-Flow Speed, $S_{FF}$	60.0					V <sub>D</sub> =	veh/h
*u	304 VCII/II	Ramp Free-F	low Speed, S <sub>FR</sub>	45.0					Ь	
Conversio	n to pc/h Un	der Base	Conditions							
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	f <sub>p</sub>	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>
Freeway	4422	0.90	Level	6	0	0.	971	1.00	50	061
Ramp	1253	0.90	Level	7	0	0.	966	1.00	14	141
UpStream	554	0.90	Level	13	0	0.	939	1.00	6	56
DownStream		لبيا								
<b>-</b> 41 41		Merge Areas			<b>F</b> = 4': = 4	•	Div	erge Areas		
Estimation	1 01 V <sub>12</sub>				Estimat	ion o	1 V <sub>12</sub>			
	$V_{12} = V_{F}$	(P <sub>FM</sub> )					V <sub>12</sub> = \	' <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>	P <sub>FD</sub>	
L <sub>EQ</sub> =	(Equa	ation 13-6 or	13-7)		L <sub>EQ</sub> =		8422	2.46 (Equation	on 13-12 o	or 13-13)
P <sub>FM</sub> =	using	Equation (I	Exhibit 13-6)		P <sub>FD</sub> =			7 using Equ		
V <sub>12</sub> =	pc/h		,		V <sub>12</sub> =			pc/h	,	,
$V_3$ or $V_{av34}$		Fouation 13	3-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>			pc/h (Equa	ation 13-1	4 or 13-17
	2,700 pc/h? ☐ Ye		110110111			>27		Yes ☑No	20011 10 1	7 01 10 17
	1.5 * V <sub>12</sub> /2 ☐ Ye							Yes ☑No		
			3-16, 13-18, or		"	•		h (Equation	13-16 13	-18 or 13-
f Yes,V <sub>12a</sub> =	13-19)		10, 10 10, 01		If Yes,V <sub>12a</sub> =	=	19)	ii (Equation	10 10, 10	10, 01 10
Capacity C	Checks				Capacit	y Ch	ecks			
	Actual	Τ (		T	T		Actual	Ca	oacity	LOS F
	Actual		Capacity	LOS F?				E 1 11 11 40 0		
	Actual	<del>                                     </del>	Japacity	LOS F?	V <sub>F</sub>		5061	Exhibit 13-8	6900	No
V <sub>FO</sub>	Actual	Exhibit 13-8	Japacity	LOS F?	$V_F$ $V_{FO} = V_F$	- V <sub>R</sub>	3620	Exhibit 13-8		No No
V <sub>FO</sub>	Actual		Capacity	LOS F?	$V_{FO} = V_{F}$	- V <sub>R</sub>		Exhibit 13-8	6900	-
		Exhibit 13-8		LOS F?	$V_{FO} = V_{F}$ $V_{R}$		3620 1441	Exhibit 13-8 Exhibit 13-10	6900 2100	No
	ring Merge In	Exhibit 13-8	Area		$V_{FO} = V_{F}$ $V_{R}$	iterin	3620 1441 <b>g Diverg</b>	Exhibit 13-8 Exhibit 13-10 Enfluence	6900 2100 ce <i>Area</i>	No No
Flow Enter		Exhibit 13-8 <b>afluence</b> Max		LOS F?	V <sub>FO</sub> = V <sub>F</sub> V <sub>R</sub>	terin	3620 1441 <b>g Diverg</b> Actual	Exhibit 13-8 Exhibit 13-10 Exhibit 13-10 Max Desirab	6900 2100 <b>ce <i>Area</i></b> le	No No Violation
Flow Enter	ring Merge In	Exhibit 13-8  Exhibit 13-8  Exhibit 13-8	<b>Area</b> Desirable		$V_{FO} = V_F$ $V_R$ Flow En	nterin	3620 1441 <b>g Diverg</b> Actual	Exhibit 13-8 Exhibit 13-10 E Influence Max Desirab Exhibit 13-8	6900 2100 <b>ce <i>Area</i></b> le 4400:All	No No Violation
Flow Enter  V <sub>R12</sub> Level of Se	ring Merge In Actual ervice Detern	Exhibit 13-8  Influence A  Max Exhibit 13-8  Influence A  Max Exhibit 13-8	Area Desirable  (if not F)		$V_{FO} = V_F$ $V_R$ Flow En	nterin	3620 1441 <b>g Diverg</b> Actual 3494 <b>vice Dete</b>	Exhibit 13-8 Exhibit 13-10 Exhibit 13-10 Max Desirab Exhibit 13-8 Exmination	6900 2100 <b>ce Area</b> le 4400:All	No No Violation
Flow Enter $V_{R12}$ Level of Set $D_R = 5.475$	Actual  ervice Determ + 0.00734 v <sub>R</sub> +	Exhibit 13-8  Influence A  Max Exhibit 13-8  Influence A  Max Exhibit 13-8	Area Desirable  (if not F)		V <sub>FO</sub> = V <sub>F</sub> V <sub>R</sub> Flow En	f Serv	3620 1441 <b>g Diverg</b> Actual 3494 <b>vice Dete</b> 1.252 + 0.0	Exhibit 13-8 Exhibit 13-10 E Influence Max Desirab Exhibit 13-8	6900 2100 <b>ce Area</b> le 4400:All	No No Violation
Flow Enter $V_{R12}$ Level of Se $D_R = 5.475$ $D_R = (pc/m)$	Actual  ervice Determ + 0.00734 v <sub>R</sub> +	Exhibit 13-8  Influence A  Max Exhibit 13-8  Influence A  Max Exhibit 13-8	Area Desirable  (if not F)		$V_{FO} = V_F$ $V_R$ Flow En $V_{12}$ Level of	<b>f Serv</b> D <sub>R</sub> = 4 2.5 (pc.	3620  1441 <b>g Diverg</b> Actual 3494  vice Dete 3.252 + 0.0  /mi/ln)	Exhibit 13-8 Exhibit 13-10 Exhibit 13-10 Max Desirab Exhibit 13-8 Exmination	6900 2100 <b>ce Area</b> le 4400:All	No No Violation
Flow Enter $V_{R12}$ Level of Se $D_R = 5.475$ $D_R = (pc/m)$ $D_R = (Exhi$	Actual  Pervice Determ + 0.00734 v R + ni/ln) ibit 13-2)	Exhibit 13-8  Influence A  Max Exhibit 13-8  Influence A  Max Exhibit 13-8	Area Desirable  (if not F)		$V_{FO} = V_F$ $V_R$ Flow En $V_{12}$ Level of $D_R = 32$ LOS = D	f Serv D <sub>R</sub> = 4 2.5 (pc,	3620 1441 <b>g Diverg</b> Actual 3494 <b>vice Dete</b> 3.252 + 0.0 /mi/ln) oit 13-2)	Exhibit 13-8 Exhibit 13-10 Exhibit 13-10 Max Desirab Exhibit 13-8 Exmination 086 V <sub>12</sub> - 0.0	6900 2100 <b>ce Area</b> le 4400:All	No No Violation
Flow Enter $V_{R12}$ Level of Se $D_R = 5.475 \cdot D_R = (pc/m LOS = (Exhi$	Actual  ervice Determ + 0.00734 v <sub>R</sub> +	Exhibit 13-8  Influence A  Max Exhibit 13-8  Influence A  Max Exhibit 13-8	Area Desirable  (if not F)		$V_{FO} = V_F$ $V_R$ Flow En $V_{12}$ Level of $D_R = 32$ $LOS = D$ Speed L	f Serv D <sub>R</sub> = 4 2.5 (pc. (Exhibit	3620  1441  g Diverg Actual 3494  vice Dete 2.252 + 0.0  /mi/ln) bit 13-2)  mination	Exhibit 13-8 Exhibit 13-10 Exhibit 13-10 Exhibit 13-10 Max Desirab Exhibit 13-8 Exmination 086 V <sub>12</sub> - 0.0	6900 2100 <b>ce Area</b> le 4400:All	No No Violation
Flow Enter $V_{R12}$ Level of Se $D_R = 5.475$ $D_R = (pc/m)$ $-0S = (Exhi)$ Speed Det	Actual  Pervice Determ + 0.00734 v R + ni/ln) ibit 13-2)	Exhibit 13-8  Influence A  Max Exhibit 13-8  Influence A  Max Exhibit 13-8	Area Desirable  (if not F)		$V_{FO} = V_F$ $V_R$ Flow En $V_{12}$ Level of $D_R = 32$ $LOS = D$ Speed L	f Serv D <sub>R</sub> = 4 2.5 (pc. (Exhibit	3620 1441 <b>g Diverg</b> Actual 3494 <b>vice Dete</b> 3.252 + 0.0 /mi/ln) oit 13-2)	Exhibit 13-8 Exhibit 13-10 Exhibit 13-10 Exhibit 13-10 Max Desirab Exhibit 13-8 Exmination 086 V <sub>12</sub> - 0.0	6900 2100 <b>ce Area</b> le 4400:All	No No Violation
Flow Enter $V_{R12}$ Level of Se $D_R = 5.475 \cdot D_R = (pc/m \cdot D_R) \cdot D_R = (Exhi \cdot D_R) \cdot $	Actual  Actual  ervice Detern + 0.00734 v R + ni/ln) ibit 13-2) ermination	Exhibit 13-8  Influence A  Max Exhibit 13-8  Influence A  Max Exhibit 13-8	Area Desirable  (if not F)		V <sub>FO</sub> = V <sub>F</sub> V <sub>R</sub> V <sub>R</sub> Flow En  V <sub>12</sub> Level of  D <sub>R</sub> = 32 LOS = D Speed E D <sub>S</sub> = 0.	f Service 12.5 (pc. (Exhibit Determ.)	3620  1441  g Diverg Actual 3494  vice Dete 2.252 + 0.0  /mi/ln) bit 13-2)  mination	Exhibit 13-8 Exhibit 13-10 Exhibit 13-10 Max Desirab Exhibit 13-8	6900 2100 <b>ce Area</b> le 4400:All	No No Violation
Flow Enter $V_{R12}$ Level of Se $D_R = 5.475$ $D_R = (pc/m)$ LOS = (Exhi  Speed Det $M_S = (Exib)$ $M_S = (m)$	Actual  Pervice Determ + 0.00734 v R +  ni/ln) ibit 13-2) Permination  oit 13-11)	Exhibit 13-8  Influence A  Max Exhibit 13-8  Influence A  Max Exhibit 13-8	Area Desirable  (if not F)		$V_{FO} = V_F$ $V_R$ $V_{RD} = V_R$	D <sub>R</sub> = 4 (Exhit) Deter 428 (E 2.3 mph	3620  1441 <b>g Diverg</b> Actual 3494 <b>rice Dete</b> 3.252 + 0.0  /mi/ln) bit 13-2) <b>mination</b> xhibit 13-1:	Exhibit 13-8 Exhibit 13-10 Exhibit 13-10 Max Desirab Exhibit 13-8 Exmination 086 V <sub>12</sub> - 0.0 2) 3-12)	6900 2100 <b>ce Area</b> le 4400:All	No No Violation

F-4320

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	1165-Cd SB On	osg SB Off to Cosg
Date Performed	7/25/2014		Jurisdiction		
Analysis Time Period	AM Peak		Analysis Year	2038 Bu Site	ild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plar	ning Data
Flow Inputs					
Volume, V AADT	5087	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 8	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length	Level mi	
			Up/Down %		
Calculate Flow Adjus	tments				
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] 0.962	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	3		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performanc	e Measures	5	Design (N)		
0			Design (N)		
Operational (LOS)	NI v. f		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x I x f_p)$	1959	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	pc/h/ln
S	57.7	mph	$x f_p$ )		po//////
$D = v_p / S$	34.0	pc/mi/ln	S		mph
LOS	D	ролити	$D = v_p / S$		pc/mi/ln
			Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed	E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens	ity	$E_{\rm T}$ - Exhibits 11-10, 11-11,		f <sub>IC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate		e-flow speed	f <sub>n</sub> - Page 11-18		TRD - Page 11-11
LOS - Level of service	BFFS - Ba	ase free-flow	LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2	IND Tage IT-II
speed DDHV - Directional design	hour volume		11-3	· · <del>-</del> ,	
DDITY - Directional design	TIOUI VOIUITIE				

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>I-26 EB</i>	
Agency or Company	Atkins		From/To	1165-C	osg SB Off to Cosg
Date Performed	7/25/2014		Jurisdiction	SB On	
Analysis Time Period	PM Peak		Analysis Year	2038 Βι Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	3169	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 7	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments				
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] <i>0.</i> 966	
Speed Inputs			Calc Speed Adj and		
Lane Width		ft	<u> </u>		
Rt-Side Lat. Clearance		ft	f <sub>LW</sub>		mph
Number of Lanes, N	3		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	•
Base free-flow Speed,		·	166	60.0	mph
BFFS		mph			
LOS and Performanc	e Measures	<u> </u>	Design (N)		
Operational (LOS)			Design (N)		
$v_p = (V \text{ or DDHV}) / (PHF x)$	Nyf		Design LOS		
v f )	1215	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	$N \times f_{HV}$	pc/h/ln
x f <sub>p</sub> )	60.0	mph	x f <sub>p</sub> )		ролин
D = v <sub>p</sub> / S	20.3	pc/mi/ln	S		mph
LOS	20.3 C	рслили	$D = v_p / S$		pc/mi/ln
LO3	C		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed	E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens	ity	$E_{\rm R}$ - Exhibits 11-10, 11-12 $E_{\rm T}$ - Exhibits 11-10, 11-11,		f <sub>LC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate	FFS - Free	e-flow speed	I '	11-10	20
LOS - Level of service		se free-flow	f <sub>p</sub> - Page 11-18	11.0	TRD - Page 11-11
speed			LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-∠,	
DDHV - Directional design	nour volume	nved	Ji 1-3		

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Navy Base ICTF

			REEWAY	WEAV			Γ			
General	Informati	on			Site Info	rmation				
Analyst Agency/Con Date Perform Analysis Tin Project Desc	med	AJR Atkins 7/25/20 AM Pea			Weaving Seg	Freeway/Dir of Travel I-26 EB Weaving Segment Location 1170 - Cosgrove SB to Cos. N Analysis Year 2038 Build - River Center Site				
Inputs	, ,									
Weaving seg Freeway fre	mber of lanes, N gment length, L <sub>e</sub> e-flow speed, Fl	s FS		One-Sided 4 600ft 60 mph	Terrain type				Freewa 1 230 Leve	
Convers	sions to po	1	ı e	1	n'				_	
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	$f_{HV}$	fp	v (pc/h)	
$V_{FF}$	4779	0.90	8	0	1.5	1.2	0.962	1.00	5522	
$V_{RF}$	436	0.90	2	0	1.5	1.2	0.990	1.00	489	
$V_{FR}$	308	0.90	7	0	1.5	1.2	0.966	1.00	354	
$V_{RR}$	0	0.90	0	0	1.5	1.2	1.000	1.00	0	
V <sub>NW</sub>	5522		•	•	•		-	V =	6365	
$V_W$	843									
VR	0.132									
Configu	ration Cha	aracteris	tics							
Minimum m	aneuver lanes,	N <sub>WL</sub>		2 lc	Minimum we	aving lane ch	nanges, ${\rm LC_{MIN}}$		843 lc/h	
Interchange	density, ID			1.0 int/mi	Weaving lan	e changes, L	$C_{W}$		1031 lc/h	
Minimum R	F lane changes,	, LC <sub>RF</sub>		1 lc/pc	Non-weaving	g lane change	es, LC <sub>NW</sub>		692 lc/h	
Minimum Fl	R lane changes,	, LC <sub>FR</sub>		1 lc/pc	Total lane ch	nanges, LC <sub>ALI</sub>	_		1723 lc/h	
Minimum R	R lane changes	, LC <sub>RR</sub>		lc/pc	Non-weaving	g vehicle inde	ex, I <sub>NW</sub>		331	
Weavin	g Segmen	t Speed,	Density, I	Level of	Service,	and Cap	acity			
Weaving se	gment flow rate	, V		6365 pc/h		ensity factor,			0.519	
Weaving se	gment capacity	, c <sub>w</sub>		7888 veh/h		gment speed,			46.1 mph	
_	gment v/c ratio			0.776		aving speed,	**		44.6 mph	
	egment density,	D	34	4.5 pc/mi/ln	1	n-weaving spe	1111		46.3 mph	
Level of Sei	rvice, LOS			D	Maximum we	eaving length	, L <sub>MAX</sub>		3857 f	
Notes										
Chapter 13, "	egments longer to Freeway Merge a es that exceed the	and Diverge Se	gments".	•		solated merge	and diverge are	eas using the p	procedures of	

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Navy Base ICTF

_			REEWA	WEAV			Γ			
General	I Informati	on			Site Info	rmation				
Analyst Agency/Con Date Perfori Analysis Tin Proiect Desi	med	AJR Atkins 7/25/20 PM Pe			Weaving Seg	Freeway/Dir of Travel I-26 EB Weaving Segment Location 1170 - Cosgrove SB to Cos. N Analysis Year 2038 Build - River Center Site				
Inputs	,									
Weaving se Freeway fre	mber of lanes, N gment length, L e-flow speed, Fl	s FS		One-Sided 4 600ft 60 mph	Terrain type				Freewa 1 230 Leve	
Conver	sions to po	1	T T	T .	W .	1				
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	$f_{HV}$	fp	v (pc/h)	
$V_{FF}$	3011	0.90	7	0	1.5	1.2	0.966	1.00	3463	
$V_{RF}$	440	0.90	2	0	1.5	1.2	0.990	1.00	494	
$V_{FR}$	158	0.90	13	0	1.5	1.2	0.939	1.00	187	
$V_{RR}$	0	0.90	0	0	1.5	1.2	1.000	1.00	0	
$V_{NW}$	3463							V =	4144	
$V_{W}$	681									
VR	0.164									
Configu	ration Cha	aracteris	tics							
Minimum m	aneuver lanes,	N <sub>WL</sub>		2 lc	Minimum we	eaving lane ch	nanges, ${\rm LC_{MIN}}$		681 lc/l	
Interchange	e density, ID			1.0 int/mi	Weaving lan	e changes, L	$C_{W}$		869 lc/h	
Minimum R	F lane changes,	, LC <sub>RF</sub>		1 lc/pc	Non-weaving	g lane change	es, LC <sub>NW</sub>		268 lc/h	
Minimum FI	R lane changes,	, LC <sub>FR</sub>		1 lc/pc	Total lane ch	nanges, LC <sub>ALI</sub>	_		1137 lc/h	
Minimum R	R lane changes	, LC <sub>RR</sub>		lc/pc	Non-weaving	g vehicle inde	ex, I <sub>NW</sub>		208	
Weavin	g Segmen	t Speed,	Density, l	Level of	Service,	and Cap	acity			
Weaving se	gment flow rate	, V		4144 pc/h		ensity factor,			0.374	
Weaving se	egment capacity	, c <sub>w</sub>		7834 veh/h	, ,	gment speed,			49.7 mph	
	egment v/c ratio			0.511	1	aving speed,	**		47.7 mph	
	egment density,	D	20	0.8 pc/mi/ln	1	n-weaving spe	1111		50.1 mph	
Level of Se	rvice, LOS			С	Maximum we	eaving length	, L <sub>MAX</sub>		4175 f	
Notes				0 1 111		1.6.1				
Chapter 13, "	egments longer to Freeway Merge a es that exceed the	and Diverge Se	gments".	-		solated merge	and diverge are	eas using the	orocedures of	

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	1175-Co NB On	osg NB Off to Cosg
Date Performed	7/25/2014		Jurisdiction		
Analysis Time Period	AM Peak		Analysis Year	2038 Bu Site	ild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plar	ning Data
Flow Inputs					
Volume, V AADT	5215	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 8	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments				
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] <i>0.</i> 962	
Speed Inputs			Calc Speed Adj and		
Lane Width		ft	<u> </u>		
Rt-Side Lat. Clearance		ft	f <sub>LW</sub>		mph
Number of Lanes, N	3		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	•
Base free-flow Speed,		mph	16.2	60.0	mph
BFFS					
LOS and Performanc	e Measures	<u> </u>	Design (N)		
Operational (LOS)			Design (N)		
$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f. s.		Design LOS		
$x f_p$	2009	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	$N \times f_{HV}$	pc/h/ln
S P'	57.0	mph	x f <sub>p</sub> )		<b>P 3</b> · · · · · ·
D = v <sub>p</sub> / S	35.3	pc/mi/ln	S		mph
LOS	E	ролиш	$D = v_p / S$		pc/mi/ln
	_		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed	E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens	ity	$E_{\rm T}$ - Exhibits 11-10, 11-11,		f <sub>IC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate		e-flow speed	f <sub>n</sub> - Page 11-18		TRD - Page 11-11
LOS - Level of service	BFFS - Ba	ase free-flow	LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2.	IND Tage 11-1
speed DDHV - Directional design	hour volume		11-3	· · <del>-</del> ,	
DDITY - Directional design	TIOUI VOIUITIE				

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	1175-Co NB On	osg NB Off to Cosg
Date Performed	7/25/2014		Jurisdiction		
Analysis Time Period	PM Peak		Analysis Year	2038 Bu Site	ild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plar	ning Data
Flow Inputs					
Volume, V AADT	3451	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 7	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		la //a	General Terrain:	Level	
DDHV = AADTX K X D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments				
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] 0.966	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	3		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed,		mph		00.0	Прп
BFFS	- Massaura		Decima (N)		
LOS and Performanc	e Measures	<u> </u>	Design (N)		
Operational (LOS)			Design (N)		
$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>Llv</sub>		Design LOS		
x f <sub>p</sub> )	1323	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	pc/h/ln
S	60.0	mph	x f <sub>p</sub> )		•
$D = v_p / S$	22.0	pc/mi/ln	S		mph
LOS	С	F -	$D = v_p / S$		pc/mi/ln
			Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens	-	E <sub>T</sub> - Exhibits 11-10, 11-11,		f <sub>LC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate		e-flow speed	f <sub>n</sub> - Page 11-18		TRD - Page 11-11
LOS - Level of service speed	BFFS - Ba	ase free-flow	LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	<b>3</b> - • •
DDHV - Directional design	hour volume		11-3	•	
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		RAI	MPS AND	RAMP JUN	CTIONS W	<u> (ORKSHI</u>	EET			
General	Inforn	nation			Site Infor	mation				
Analyst		AJR			reeway/Dir of Tr		I-26 EB	0 ND		
Agency or Co Date Perform	, ,	Atkin			unction		1180 - EB On fr	rom Cosgrove NB		
nalysis Time		7/25/: AM P			urisdiction nalysis Year		2038 Build - Riv	or Contor Sito		
		Navy Base ICT		A	naiysis reai		2036 Bulla - KIV	er Center Site		
nputs	ιριιστι τ	vavy base io i	1							
•	: D		Freeway Num	ber of Lanes, N	3				D	A . l:
lpstream Ad	j Kamp		Ramp Number		1				Downstre Ramp	eam Adj
Yes	On		l '	ane Length, L	440					_
			1	ane Length, L <sub>A</sub>	440				☐Yes	∐ On
✓ No	Off		1	- 5	5215				✓ No	Off
=	ft		Freeway Volum						L <sub>down</sub> =	ft
up =	10		Ramp Volume	**	881				down	
′ <sub>u</sub> =	veh/h		1	-Flow Speed, S <sub>FF</sub>	60.0				$V_D =$	veh/h
				ow Speed, S <sub>FR</sub>	45.0					
Convers	ion to	•	der Base (	Conditions	1	Ī	1	1	Ī	
(pc/h)		V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	f <sub>p</sub>	v = V/PH	$F x f_{HV} x f_{p}$
reeway		5215	0.90	Level	8	0	0.962	1.00		6026
Ramp		881	0.90	Level	17	0	0.922	1.00		1062
JpStream										
DownStream	1									
			Merge Areas					Diverge Areas		
stimati	on of	V <sub>12</sub>				Estimat	ion of v <sub>12</sub>			
		$V_{12} = V_{F}$	(P <sub>FM</sub> )				V <sub>40</sub> :	= V <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>	)P_D	
<sub>EQ</sub> =		(Equa	ation 13-6 or	13-7)		L <sub>EQ</sub> =	12	(Equation 13		13)
<sub>FM</sub> =		0.590	using Equat	ion (Exhibit 13-6)	)	P <sub>FD</sub> =		using Equation		
' <sub>12</sub> =		3554	oc/h			V <sub>12</sub> =		pc/h	or (Exhibit	10 1)
' <sub>3</sub> or V <sub>av34</sub>		2472	oc/h (Equatio	on 13-14 or 13-		V <sub>3</sub> or V <sub>av34</sub>		pc/h (Equation	12 11 or 12	17\
		17)					> 2 700 pg/b2	Yes No		17)
		pc/h? TYes								
s V <sub>3</sub> or V <sub>av3</sub>	<sub>4</sub> > 1.5 * \	V <sub>12</sub> /2 ☐ Ye						☐Yes ☐No pc/h (Equation		12 10 or
Yes,V <sub>12a</sub> =		pc/h ( 13-19)		3-16, 13-18, or		If Yes,V <sub>12a</sub> =	:	13-19)	113-10,	13-10, 01
Capacity	Chec					Canacit	y Checks	,		
Japacity	Oned	Actual	С	apacity	LOS F?	Jupach	Actua	al Ca	pacity	LOS F?
	$\neg$	riotaai	<del>l ĭ</del>	араону	2001:	V <sub>F</sub>	710101	Exhibit 13-	· _ ·	2001:
						V <sub>FO</sub> = V <sub>F</sub>	- \/	Exhibit 13-	_	_
$V_{FO}$		7088	Exhibit 13-8		Yes		VR	Exhibit 13		_
						$V_R$		10		
low En	tering	Merge In	fluence A	rea		Flow En	tering Div	erge Influer	ice Area	7
	Ĭ	Actual		Desirable	Violation?		Actual	Max Des		Violation?
$V_{R12}$		4616	Exhibit 13-8	4600:AII	Yes	V <sub>12</sub>		Exhibit 13-8		
evel of	Servi	ce Detern	nination (i	if not F)		Level of	Service D	eterminatio	n (if no	t F)
D <sub>R</sub> = \$	5.475 + 0	.00734 v <sub>R</sub> + 0	0.0078 V <sub>12</sub> - 0.0	00627 L <sub>A</sub>			D <sub>R</sub> = 4.252 +	0.0086 V <sub>12</sub> - 0	.009 L <sub>D</sub>	
	.2 (pc/mi/			**		$D_R = (p$	c/mi/ln)		_	
	Exhibit 13					1	Exhibit 13-2)			
Speed D		•				`	Determinat	ion		
-	76 (Exibi					<del>  '                                   </del>	xhibit 13-12)			
		Exhibit 13-11)				1	ph (Exhibit 13-1	2)		
= 17	o mon (F	:XIIIDIL 13-11)				IFR III	P (=XIIIDIL 10-1	-,		
						1	nh (Exhihit 13 <sub>-</sub> 1	2)		
5 <sub>0</sub> = 52.	4 mph (E	xhibit 13-11) xhibit 13-13)				$S_0 = m$	ph (Exhibit 13-1 ph (Exhibit 13-1			

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			MPS AND	RAMP JUN			EET			
General	Inform	nation			Site Infor	mation				
Analyst		AJR		Fi	reeway/Dir of Tr	avel	I-26 EB			
Agency or C	. ,	Atkin			unction		1180 - EB On 1	from Cosgrove NB	1	
Date Perforr		4/25/			urisdiction					
Analysis Tim		PM P		A	nalysis Year		2038 Build - R	iver Center Site		
	cription	Navy Base ICT	F							
nputs			I Ni	f l N					1	
Jpstream A	dj Ramp		1 '	per of Lanes, N	3				Downstre	eam Adj
Yes	On		Ramp Number		1				Ramp	
⊔ res	□On		Acceleration L	ane Length, L <sub>A</sub>	440				□Yes	On
☑ No	☐ Off		Deceleration L	ane Length L <sub>D</sub>					✓ No	Off
	_ 0		Freeway Volur	ne, V <sub>F</sub>	3451				I NO	
=	ft		Ramp Volume	, V <sub>D</sub>	478				L <sub>down</sub> =	ft
			1	Flow Speed, S <sub>FF</sub>	60.0					
/ <sub>u</sub> =	veh/h		Ramp Free-Flo		45.0				$V_D =$	veh/h
Convor	sion to	nc/h Hn/		Conditions	70.0					
		<del>γρε/π οπο</del> ∀								
(pc/h	1)	(Veh/hr)	PHF	Terrain	%Truck	%Rv	$f_HV$	f <sub>p</sub>	v = V/PH	$F x f_{HV} x f_{p}$
Freeway		3451	0.90	Level	7	0	0.966	1.00		3969
Ramp		478	0.90	Level	27	0	0.881	1.00		603
UpStream										
DownStrea	m									
			Merge Areas					Diverge Areas		
Estimat	ion of	V <sub>12</sub>				Estimat	ion of v <sub>12</sub>			
		V <sub>12</sub> = V <sub>F</sub>	( P <sub>EM</sub> )				\/	= V <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>	/D	
- <sub>EQ</sub> =			ation 13-6 or	13-7)		_	<sup>V</sup> 12			40)
P <sub>FM</sub> =				on (Exhibit 13-6)	١	L <sub>EQ</sub> =		(Equation 13		
/ <sub>12</sub> =		2341		OTT (EXHIBIT TO 0)	/	P <sub>FD</sub> =		using Equation	on (Exhibit 1	13-7)
				on 13-14 or 13-		V <sub>12</sub> =		pc/h		
$V_3$ or $V_{av34}$		17)	pc/ii (Equalic	JII 13-14 01 13-		V <sub>3</sub> or V <sub>av34</sub>		pc/h (Equation		17)
Is V <sub>3</sub> or V <sub>3V</sub>	<sub>34</sub> > 2,700	) pc/h?Ye:	s 🗸 No			Is V <sub>3</sub> or V <sub>av</sub>	<sub>34</sub> > 2,700 pc/h	? ☐ Yes ☐ No	)	
		V <sub>12</sub> /2 ☐ Yes				Is V <sub>3</sub> or V <sub>av</sub>	<sub>34</sub> > 1.5 * V <sub>12</sub> /2	☐Yes ☐No	)	
				-16, 13-18, or		If Yes,V <sub>12a</sub> =		pc/h (Equation	on 13-16, 1	13-18, or
f Yes,V <sub>12a</sub> =	-	13-19)		· · · · ·				13-19)		
Capacit	y Che	cks				Capacit	y Checks			
		Actual	C	apacity	LOS F?		Actu	ıal Ca	apacity	LOS F?
						V <sub>F</sub>		Exhibit 13	-8	
V <sub>F</sub>		4572	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>	Exhibit 13	-8	
*FC	)	4012	EXHIBIT 10-0		140			Exhibit 13	3-	
						V <sub>R</sub>		10		
Flow En	itering	Merge In	fluence A	rea		Flow Er	tering Div	verge Influe	nce Area	9
		Actual	Max	Desirable	Violation?		Actual	Max Des		Violation
$V_{R1}$	2	2944	Exhibit 13-8	4600:AII	No	V <sub>12</sub>		Exhibit 13-8		
_evel of	Servi	ce Detern	nination (i	f not F)		Level of	Service L	Determination	on (if no	t F)
			0.0078 V <sub>12</sub> - 0.0	•			D <sub>R</sub> = 4.252 +	+ 0.0086 V <sub>12</sub> - 0	0.009 L <sub>D</sub>	
11	5.4 (pc/mi	11	14	П		L	oc/mi/ln)	12	D	
	(Exhibit 1					1	Exhibit 13-2)			
	`	•				`		tion		
_		ination					<u>Determina</u>	иоп		
$M_{\rm S} = 0.$	355 (Exib	it 13-11)					Exhibit 13-12)			
S <sub>R</sub> = 53	3.6 mph (E	Exhibit 13-11)				S <sub>R</sub> = m	ph (Exhibit 13-	12)		
	5.9 mph (I	Exhibit 13-11)				$S_0 = m$	ph (Exhibit 13-	12)		
•		Exhibit 13-13)				S = m	ph (Exhibit 13-	13)		
		,				1		•		

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	T	
General Information			Site Information		
Analyst Agency or Company Date Performed	AJR Atkins 7/25/2014		Highway/Direction of Trave From/To Jurisdiction	1190 - (	Cosgrove to US-52
Analysis Time Period	AM Peak		Analysis Year	2038 Bi Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			es.(N)	Pla	nning Data
Flow Inputs					
Volume, V AADT	6096	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 8	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$		
Speed Inputs			Calc Speed Adj and	<u>FFS</u>	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	3		$f_{LC}$		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			r
LOS and Performanc	e Measures	6	Design (N)		
Operational (LOS) v <sub>p</sub> = (V or DDHV) / (PHF x	N x f <sub>try</sub>		Design (N) Design LOS		
x f <sub>p</sub> )		pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x x f_p)$	N x f <sub>HV</sub>	pc/h/ln
S - v / S	49.8	mph	S		mph
D = v <sub>p</sub> / S	47.1 F	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	Γ		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed DDHV - Directional design	BFFS - Ba		E <sub>R</sub> - Exhibits 11-10, 11-12 E <sub>T</sub> - Exhibits 11-10, 11-11, f <sub>p</sub> - Page 11-18 LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	, 11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	T	
General Information			Site Information		
Analyst Agency or Company Date Performed	AJR Atkins 7/25/2014		Highway/Direction of Trave From/To Jurisdiction	1190 - (	Cosgrove to US-52
Analysis Time Period	PM Peak		Analysis Year	2038 Bi Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			es.(N)	Pla	nning Data
Flow Inputs					
Volume, V AADT	3929	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 7	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1)] 0.966	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	3		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph		00.0	трп
LOS and Performanc	e Measures	3	Design (N)		
Operational (LOS) v <sub>p</sub> = (V or DDHV) / (PHF x	N x f		<u>Design (N)</u> Design LOS		
x t <sub>p</sub> )		pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x x f_p)$	N x f <sub>HV</sub>	pc/h/ln
S D = · · · / C	60.0	mph	s		mph
D = v <sub>p</sub> / S	25.1	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	С		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed DDHV - Directional design	BFFS - Ba		E <sub>R</sub> - Exhibits 11-10, 11-12 E <sub>T</sub> - Exhibits 11-10, 11-11, f <sub>p</sub> - Page 11-18 LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1

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		RAMP	S AND RAI	/IP JUNCTI	ONS WO	RKS	HEET			
General Infor	mation			Site Infor						
Analyst Agency or Company		IS		reeway/Dir of Tr		-26 EB 1200-E		S-52 & PAR		
Date Performed Analysis Time Period		/2014		Jurisdiction Analysis Year	2	2020 D	uild Divor	Center Site		
Project Description				Alialysis i cal		2030 D	uliu - Kivel	Certier Site		
Inputs	Havy Bass to									
Upstream Adj R	lamp	Freeway Num	ber of Lanes, N	3					Downstrea	m Adj
	· ] On	Ramp Numbe	· ·	1					Ramp	
L 163 L	1011	1	ane Length, L <sub>A</sub>	240					Yes	On
✓ No	Off	Freeway Volu	ane Length L <sub>D</sub>	340 6096					✓ No	Off
L <sub>up</sub> = f	ť	Ramp Volume		813					L <sub>down</sub> =	ft
\/ <b>-</b> \/	eh/h		-Flow Speed, S <sub>FF</sub>	60.0					V <sub>D</sub> =	veh/h
u			ow Speed, S <sub>FR</sub>	45.0					۵.	VC11/11
Conversion t	i -	der Base	Conditions			,				
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	f <sub>p</sub>	v = V/PHF	$x f_{HV} x f_{p}$
Freeway	6096	0.90	Level	8	0	0.9	962	1.00	704	4
Ramp	813	0.90	Level	25	0	0.8	889	1.00	101	6
UpStream				+		+-				
DownStream		Merge Areas						Diverge Areas		
Estimation of		merge Areas			Estimation	on o		riverge Areas		
	V <sub>12</sub> = V <sub>F</sub>	(P=,,)						· V <sub>R</sub> + (V <sub>F</sub> - V <sub>R</sub>	)P <sub>ED</sub>	
L <sub>EQ</sub> =		ation 13-6 or	13-7)		L <sub>EQ</sub> =			Equation 13-1		
P <sub>FM</sub> =		Equation (E			P <sub>FD</sub> =		0.	537 using Equ	ation (Exhib	it 13-7)
V <sub>12</sub> =	pc/h		,		V <sub>12</sub> =			254 pc/h	,	,
V <sub>3</sub> or V <sub>av34</sub>		Equation 13	-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>			'90  pc/h (Equa	ation 13-14	or 13-17)
Is $V_3$ or $V_{av34} > 2,70$			,			<sub>4</sub> > 2,70		ZYes □No		,
Is $V_3$ or $V_{av34} > 1.5$								Yes ☑No		
If Yes,V <sub>12a</sub> =		Equation 13	-16, 13-18, or		If Yes,V <sub>12a</sub> =		43	344 pc/h (Equa 13-19)	ation 13-16,	, 13-18,
Capacity Che	ecks				Capacity	/ Che	ecks			
	Actual	C	apacity	LOS F?			Actual	_	pacity	LOS F?
					V <sub>F</sub>		7044	Exhibit 13-8		Yes
V <sub>FO</sub>		Exhibit 13-8			V <sub>FO</sub> = V <sub>F</sub>	- V <sub>R</sub>	6028	Exhibit 13-8		No
<u> </u>		<u> </u>			V <sub>R</sub>	4	1016	Exhibit 13-10		No
Flow Entering	Actual	1	<b>rea</b> Desirable	Violation?	Flow Ent		g <i>Divel</i> Actual	rge Influend Max Desirab		Violation?
V <sub>R12</sub>	Actual	Exhibit 13-8	Desirable	Violations	V <sub>12</sub>	$\overline{}$	254	Exhibit 13-8	4400:All	No
Level of Serv	ice Detern	nination (	if not F)		+	Serv	rice De	termination	if not F	-)
D <sub>R</sub> = 5.475 + 0.					П	O <sub>R</sub> = 4	.252 + 0	.0086 V <sub>12</sub> - 0.0	009 L <sub>D</sub>	
D <sub>R</sub> = (pc/mi/ln	1)				$D_R = 38.$	.6 (pc/	mi/ln)			
LOS = (Exhibit	13-2)				LOS = F(	(Exhib	it 13-2)			
Speed Deterr	nination				Speed D	eteri	minatic	n		
M <sub>S</sub> = (Exibit 1	3-11)				1 *		xhibit 13-			
S <sub>R</sub> = mph (Exh	nibit 13-11)				1.1		(Exhibit			
	nibit 13-11)				1		(Exhibit			
	nibit 13-13)				S = 55.	.2 mph	(Exhibit	13-13)		
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General Info	ormation	I VANIAL .	S AND RAM	Site Infor		1110				
						100 55				
Analyst Agency or Compa	AJR Atkin			reeway/Dir of Tr		1-26 EB		50		
agency or Compa Date Performed	=	ns /2014		unction urisdiction		1200-E	B Off to US	-JZ		
Analysis Time Per				nalysis Year		2038 D	uild Divor	Center Site		
	n Navy Base IC		Al	ilalysis i eal		2030 D	ulia - Rivei	Center Site		
nputs	II Navy base 10	11								
•	l' D	Freeway Num	ber of Lanes, N	3					Daywaataa	A al:
Upstream Ad	ј катр	Ramp Numbe		1					Downstrea Ramp	ım Aaj
□Yes	□On	l '	ane Length, L	'					·	_
		1	,,	240					Yes	On
✓ No	Off	1	ane Length L <sub>D</sub>	340					✓ No	Off
1 -	£.	Freeway Volu		3929					l. =	ft
L <sub>up</sub> =	ft	Ramp Volume	13	670					L <sub>down</sub> =	
V <sub>11</sub> =	veh/h		-Flow Speed, S <sub>FF</sub>	60.0					V <sub>D</sub> =	veh/h
* u	VCII/II	Ramp Free-Fl	ow Speed, S <sub>FR</sub>	45.0					D	
Conversion	to pc/h Un	der Base (	Conditions							
(pc/h)	() (a la (la ra)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	f <sub>p</sub>	v = V/PHF	x f <sub>HV</sub> x f <sub>n</sub>
reeway	(Veh/hr) 3929	0.90	Level	7	0		966	1.00	45	<u> </u>
Ramp	670	0.90	Level	16	0	$\overline{}$	926	1.00	80	
JpStream	070	0.30	Level	10	U	1 0.	520	1.00	- 00	) <del>-</del>
DownStream	+	+				+				
		Merge Areas		•				iverge Areas		
stimation	of v <sub>12</sub>				Estimation of v <sub>12</sub>					
	V <sub>12</sub> = V <sub>F</sub>	( P <sub>EM</sub> )					V <sub>40</sub> =	V <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>	)P <sub>ED</sub>	
<sub>EQ</sub> =		ation 13-6 or	13-7)		L <sub>EQ</sub> = (Equation 13-12 or 13-13)					
		Equation (E			P <sub>FD</sub> = 0.610 using Equation (Exhibit 13-7)					
o <sub>FM</sub> = o <sub>12</sub> =	pc/h	Equation (E			V <sub>12</sub> =				iation (Exili	DIC 13-1)
	•	(Caucation 40	44 40 47)		1			70 pc/h		40 47
or V <sub>av34</sub>			-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>	. 0.7		48 pc/h (Equ	ation 13-14	FOR 13-17
	2,700 pc/h? ☐ Ye							Yes ☑ No		
is $V_3$ or $V_{av34} > 1$	.5 * V <sub>12</sub> /2 Ye		10 10 10					Yes ☑ No	10 10 10	40 40
Yes,V <sub>12a</sub> =	pc/n ( 13-19)	` '	-16, 13-18, or		If Yes,V <sub>12a</sub> =	:	19	c/h (Equation	13-16, 13-	18, or 13
Capacity Cl		/			Capacit	v Che		7		
rapaorty or	Actual		apacity	LOS F?		) (1)	Actual	Ca	pacity	LOS F
	7.0,00.	<del>† j</del>	<u> </u>		V <sub>F</sub>		4518	Exhibit 13-8	1	No
\/		Exhibit 13-8			$V_{FO} = V_{F}$	\/	3714	Exhibit 13-8	_	_
		EXHIDIC 13-0			-	- VR		_	_	No
$V_{FO}$					V <sub>R</sub>		804	Exhibit 13-1		No
	Flow Entering Merge Influence Area					torin	g Diver	ge Influen	ce Area	1 1 2 1 2
				\	Flow En	_			L	
Flow Enteri	Actual	Max	Desirable	Violation?		1	Actual	Max Desirab		Violation
Flow Enteri	Actual	Max Exhibit 13-8	Desirable	Violation?	V <sub>12</sub>	3	Actual 070	Max Desirab Exhibit 13-8	4400:All	No
V <sub>R12</sub>	Actual  rvice Deterr	Max Exhibit 13-8	Desirable  if not F)	Violation?	V <sub>12</sub> Level of	3 Serv	Actual 070 vice Det	Max Desirab Exhibit 13-8 te <b>rminatio</b>	4400:All <b>n (if not</b> l	No
V <sub>R12</sub>	Actual	Max Exhibit 13-8	Desirable  if not F)	Violation?	V <sub>12</sub> Level of	3 Serv	Actual 070 vice Det	Max Desirab Exhibit 13-8	4400:All <b>n (if not</b> l	No
Flow Enterior $V_{R12}$ evel of Set $D_R = 5.475 + 400$	rvice Determ 0.00734 v <sub>R</sub> +	Max Exhibit 13-8	Desirable  if not F)	Violation?	V <sub>12</sub> Level of	3 Serv	Actual 070 vice Det 252 + 0.	Max Desirab Exhibit 13-8 te <b>rminatio</b>	4400:All <b>n (if not</b> l	No
Flow Enterior $V_{R12}$ Level of Selon $D_R = 5.475 + 0.0$ $C_R = 0.00$ $C_R = 0.00$	rvice Determ 0.00734 v <sub>R</sub> +	Max Exhibit 13-8	Desirable  if not F)	Violation?	V <sub>12</sub> <b>Level of</b> D <sub>R</sub> = 27	3 F <b>Serv</b> D <sub>R</sub> = 4 7.6 (pc/	Actual 070 vice Det 252 + 0.	Max Desirab Exhibit 13-8 te <b>rminatio</b>	4400:All <b>n (if not</b> l	No
Flow Enterion $V_{R12}$ Level of Selucion $D_{R} = 5.475 + 0$ $D_{R} = (pc/mi.)$	Actual  rvice Deterr  0.00734 v <sub>R</sub> +  i/ln)  oit 13-2)	Max Exhibit 13-8	Desirable  if not F)	Violation?	V <sub>12</sub> <b>Level of</b> D <sub>R</sub> = 27	3 F <b>Serv</b> D <sub>R</sub> = 4 7.6 (pc/	Actual 070 070 070 070 070 070 070 070 070 07	Max Desirab Exhibit 13-8 Eermination 0086 V <sub>12</sub> - 0.0	4400:All <b>n (if not</b> l	No
Flow Enterion $V_{R12}$ Level of Selection $D_R = 5.475 + 0$ $D_R = (pc/mi.)$ $OS = (Exhib)$ Speed Determination	Actual  rvice Determ  0.00734 v <sub>R</sub> +  i/ln)  oit 13-2)  ermination	Max Exhibit 13-8	Desirable  if not F)	Violation?	V <sub>12</sub> Level of  D <sub>R</sub> = 27  LOS = C  Speed L	3 F Serv D <sub>R</sub> = 4 7.6 (pc/ (Exhib	Actual 070 vice Det .252 + 0. mi/ln) bit 13-2)	Max Desirab Exhibit 13-8 termination 0086 V <sub>12</sub> - 0.0	4400:All <b>n (if not</b> l	No
Flow Enterion $V_{R12}$ Level of Selection $D_R = 5.475 + C_R = (pc/mi.)$ $COS = (Exhib)$ Speed Dete	Actual  rvice Deterr  0.00734 v <sub>R</sub> +  i/ln)  oit 13-2)  ermination  t 13-11)	Max Exhibit 13-8	Desirable  if not F)	Violation?	V <sub>12</sub> Level of D <sub>R</sub> = 27 LOS = C Speed L D <sub>S</sub> = 0.	370 (Exhib	Actual 070 vice Det 252 + 0. mi/ln) oit 13-2) minatio chibit 13-	Max Desirab Exhibit 13-8 Rermination 0086 V <sub>12</sub> - 0.0	4400:All <b>n (if not</b> l	No
Flow Enterion $V_{R12}$ Level of Sel $D_R = 5.475 + 0$ $D_R =	Actual  rvice Determ 0.00734 v R + i/ln) bit 13-2) ermination t 13-11) Exhibit 13-11)	Max Exhibit 13-8	Desirable  if not F)	Violation?	$\begin{array}{c c} V_{12} \\ \hline V_{12} \\ \hline Level of \\ \hline D_R = & 27 \\ LOS = & C \\ \hline Speed E \\ \hline D_S = & 0. \\ \hline S_R = & 53 \\ \hline \end{array}$	37.6 (pc/ (Exhib.) (Exhib.) (Exhib.) (Exhib.)	Actual 070 vice Det .252 + 0. mi/ln) bit 13-2) minatio khibit 13- (Exhibit	Max Desirab Exhibit 13-8 Rermination 0086 V <sub>12</sub> - 0.0	4400:All <b>n (if not</b> l	No
Flow Enterion $V_{R12}$ Level of Selection $D_R = 5.475 + 10^{10}$ $COS = (Exhibit)$ Speed Determination $COS = (Exhibit)$	Actual  rvice Deterr  0.00734 v <sub>R</sub> +  i/ln)  oit 13-2)  ermination  t 13-11)	Max Exhibit 13-8	Desirable  if not F)	Violation?	$V_{12}$ <b>Level of</b> $D_R = 27$ $LOS = C$ <b>Speed L</b> $D_S = 0.0$ $S_R = 53$ $S_0 = 64$	7.6 (pc/ (Exhib) Deterior 370 (E: 3.3 mph	Actual 070 vice Det 252 + 0. mi/ln) oit 13-2) minatio chibit 13-	Max Desirab Exhibit 13-8 Remination 0086 V <sub>12</sub> - 0.0  12) 13-12)	4400:All <b>n (if not</b> l	No

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed	AJR Atkins 7/25/2014		Highway/Direction of Trave From/To Jurisdiction	1205 - F	PAR Off to PAR On
Analysis Time Period	AM Peak		Analysis Year	2038 Bu Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			es.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	5283	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 8	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub> E <sub>T</sub>	1.00 1.5		$E_{R}$ $f_{HV} = \frac{1}{[1 + P_{T}(E_{T} - 1) + P_{R}(E_{R} - 1)]}$	1.2	
Speed Inputs	7.0		Calc Speed Adj and		
Lane Width		ft	Care opoca / taj arra		
Rt-Side Lat. Clearance		ft	f <sub>LW</sub>		mph
Number of Lanes, N	3		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph		00.0	тіріі
LOS and Performanc	e Measures	<b>S</b>	Design (N)		
Operational (LOS) v <sub>p</sub> = (V or DDHV) / (PHF x I	N x f <sub>HV 2025</sub>	o a lla lla	Design (N) Design LOS	N v f	
x f <sub>p</sub> ) S	2035 56.6	pc/h/ln mph	$v_p = (V \text{ or DDHV}) / (PHF x x f_p)$	IN X I <sub>HV</sub>	pc/h/ln
D = v <sub>p</sub> / S	36.0	pc/mi/ln	S		mph
LOS	E	религи	$D = v_p / S$ Required Number of Lanes	s. N	pc/mi/ln
Glossary			Factor Location		
N - Number of lanes	S - Spee	-d			
V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service	D - Dens FFS - Free		$E_R$ - Exhibits 11-10, 11-12 $E_T$ - Exhibits 11-10, 11-11, $f_p$ - Page 11-18 LOS, S, FFS, $v_p$ - Exhibits	11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1
speed DDHV - Directional design	hour volume		11-3		
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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed	AJR Atkins 7/25/2014		Highway/Direction of Trave From/To Jurisdiction	1205 - F	PAR Off to PAR On
Analysis Time Period	PM Peak		Analysis Year	2038 Bu Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	3259	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 7	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub> E <sub>T</sub>	1.00 1.5		$E_R$ $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1.2	
Speed Inputs	1.0		Calc Speed Adj and		
Lane Width		ft	Caro opoca / taj arra		
Rt-Side Lat. Clearance		ft	f <sub>LW</sub>		mph
Number of Lanes, N	3		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			тірті
LOS and Performanc	e Measures	<b>3</b>	Design (N)		
<u>Operational (LOS)</u> v <sub>p</sub> = (V or DDHV) / (PHF x I	N x f <sub>HV</sub>		Design (N) Design LOS	N f	
x f <sub>p</sub> ) S	60.0	pc/h/ln mph	$v_p = (V \text{ or DDHV}) / (PHF x x f_p)$	N X T <sub>HV</sub>	pc/h/ln
D = v <sub>p</sub> / S	20.8	pc/mi/ln	S		mph
LOS	C	релипли	$D = v_p / S$ Required Number of Lanes	s N	pc/mi/ln
Glossary			Factor Location		
N - Number of lanes	S - Spee	ad			
V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service	D - Dens FFS - Free		E <sub>R</sub> - Exhibits 11-10, 11-12 E <sub>T</sub> - Exhibits 11-10, 11-11, f <sub>p</sub> - Page 11-18	11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1
speed DDHV - Directional design	hour volume		LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	17-2,	
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# RAMP ADD OR DROP LANE ANALYSIS (MAINLINE <55 MPH) ATKINS

### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 3/20/2014 2038 Build-River Center Site AM Peak Navy Base ICTF Freeway/Direction Junction Segment ID

EB US-52 & PAR Off Ramp US-52 & PAR EB Ramp Split 1208

### Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	1	1	1
Free-Flow Speed, FFS (mph)	45	55	45
Volume, V (veh/h)	813	500	313
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	25%	15%	41%
%RVs, P <sub>R</sub>	0%	0%	0%

### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.89	0.93	0.83
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	1,016	597	419
Capacity Flow Rate, c (pc/h/ln)	2,100	2,200	2,100
v/c ratio	0.48	0.27	0.20
Density, D <sub>MD</sub> (pc/mi/ln)	17.8	10.4	7.3
LOS	В	В	А

### Formulas and Reference Material

f<sub>HV</sub> =

 $\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$ 

HCM 2010, Equation 11-3

V. =

V PHF\*N\*f<sub>HV</sub>\*f<sub>P</sub>

HCM 2010, Equation 11-2

 $D_{MD} =$ 

0.0175\*v<sub>f</sub> N

HCM 2010, Equation 13-26

## Ramp Roadways Max Service Flow Rates

1 IOW Hates				
	Capacity			
FFS (mi/h)	(pc/h/ln)			
> 50	2,200			
>40-50	2,100			
>30-40	2,000			
≥20-30	1,900			
<20	1,800			

Source: HCM 2010, Exhibit 13-10

#### Diverge LOS Thresholds

21101g0 20	
	Density
LOS	(pc/mi/ln)
Α	≤10
В	>10-20
С	>20-28
D	>28-35
Е	>35
F	v/c > 1

Source: HCM 2010, Exhibit 13-2

# RAMP ADD OR DROP LANE ANALYSIS (MAINLINE <55 MPH) ATKINS

### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 3/20/2014 2038 Build-River Center Site PM Peak Navy Base ICTF Freeway/Direction Junction Segment ID

EB US-52 & PAR Off Ramp US-52 & PAR EB Ramp Split 1208

### Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	1	1	1
Free-Flow Speed, FFS (mph)	45	55	45
Volume, V (veh/h)	670	562	108
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	16%	12%	36%
%RVs, P <sub>R</sub>	0%	0%	0%

### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.93	0.94	0.85
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	804	662	142
Capacity Flow Rate, c (pc/h/ln)	2,100	2,200	2,100
v/c ratio	0.38	0.30	0.07
Density, D <sub>MD</sub> (pc/mi/ln)	14.1	11.6	2.5
LOS	В	В	Α

### Formulas and Reference Material

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

HCM 2010, Equation 11-2

$$D_{MD} =$$

HCM 2010, Equation 13-26

## Ramp Roadways Max Service Flow Rates

1 IOW Hates				
	Capacity			
FFS (mi/h)	(pc/h/ln)			
> 50	2,200			
>40-50	2,100			
>30-40	2,000			
≥20-30	1,900			
<20	1,800			

Source: HCM 2010, Exhibit 13-10

#### Diverge LOS Thresholds

21101g0 20	
	Density
LOS	(pc/mi/ln)
Α	≤10
В	>10-20
С	>20-28
D	>28-35
Е	>35
F	v/c > 1

Source: HCM 2010, Exhibit 13-2

General Infor	mation			Site Infori	mation					
Analyst	AJR			eeway/Dir of Tra		-26 EB				
Agency or Company	Atkin	IS	Junction			210 - EB On	from PAR			
Date Performed		2014		risdiction						
Analysis Time Period	I AM F	Peak	An	alysis Year	2	2038 Build - F	River Center Site			
Project Description	Navy Base IC	ΓF								
Inputs										
Jpstream Adj Ramp		1 '	per of Lanes, N	3				Downstr	eam Adj	
☐ Yes ☐ On	l	Ramp Number	ane Length, L <sub>a</sub>	1 1000				Ramp		
✓ No ☐ Off Deceleration Lane Length L <sub>D</sub>			1000				Yes	☐ On		
☑ No ☐ Oπ	Ī	Freeway Volur	- 5	5283				☑ No	Off	
L <sub>up</sub> = ft		Ramp Volume		328				L <sub>down</sub> =	ft	
		Freeway Free-	Flow Speed, S <sub>FF</sub>	60.0				V <sub>D</sub> =	veh/h	
$V_u$ = veh/h Ramp Free-Flow Speed, $S_{FR}$			55.0				VD -	V G I I/ I I		
Conversion to	pc/h Un	der Base (	Conditions							
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	f <sub>p</sub>	v = V/PH	IF x f <sub>HV</sub> x f <sub>p</sub>	
Freeway	5283	0.90	Level	8	0	0.962	1.00		6105	
Ramp	328	0.90	Level	41	0	0.830	1.00		439	
UpStream										
DownStream										
Falima ali a can		Merge Areas			Fatime of		Diverge Areas	S		
Estimation of					Estimati	on of V <sub>12</sub>	?			
	$V_{12} = V_{F}$	( P <sub>FM</sub> )			$V_{12} = V_R + (V_F - V_R)P_{FD}$					
L <sub>EQ</sub> =	(Equ	ation 13-6 or	13-7)		L <sub>EQ</sub> = (Equation 13-12 or 13-13)					
P <sub>FM</sub> =	0.605	using Equati	on (Exhibit 13-6)		P <sub>FD</sub> = using Equation (Exhibit 13-7)					
V <sub>12</sub> =	3697	pc/h			$V_{12} = pc/h$					
V <sub>3</sub> or V <sub>av34</sub>	2408	pc/h (Equatio	on 13-14 or 13-		V <sub>3</sub> or V <sub>av34</sub> pc/h (Equation 13-14 or 13-17)					
	17)				Is $V_3$ or $V_{av34} > 2,700$ pc/h? $\square$ Yes $\square$ No					
Is $V_3$ or $V_{av34} > 2,70$										
Is $V_3$ or $V_{av34} > 1.5$ *						1 - 1.5 V <sub>12</sub> /2	<sup>2</sup> □Yes □N pc/h (Equat		13_18 or	
If Yes,V <sub>12a</sub> =	pc/h 13-19		-16, 13-18, or		If Yes,V <sub>12a</sub> =		13-19)		13-10, 01	
Capacity Che		)			Capacity	Checks				
capacity circ	Actual	C	apacity	LOS F?		Act		Capacity	LOS F?	
		† Ť			V <sub>F</sub>	7.00	Exhibit 1	<del>'                                    </del>		
	0544	E. I. II. 10 0		,,	$V_{FO} = V_F$	· V <sub>D</sub>	Exhibit 1		+	
V <sub>FO</sub>	6544	Exhibit 13-8		No		· R	Exhibit 1		+	
					V <sub>R</sub> 10					
Flow Entering	Merge Ir	fluence A	rea		Flow En	tering Di	verge Influe		a	
	Actual	1 -	Desirable	Violation?		Actual		esirable	Violation?	
V <sub>R12</sub>	4136	Exhibit 13-8	4600:AII	No	V <sub>12</sub>		Exhibit 13-8			
Level of Serv	ice Deterr	nination (i	f not F)		Level of	Service	Determinat	ion (if no	t F)	
$D_R = 5.475 +$	0.00734 v <sub>R</sub> +	0.0078 V <sub>12</sub> - 0.0	0627 L <sub>A</sub>			$_{R} = 4.252$	+ 0.0086 V <sub>12</sub> -	0.009 L <sub>D</sub>		
$D_{R} = 31.3 (\text{pc/m})$	i/ln)				$D_R = (p_0)$	c/mi/ln)				
LOS = D (Exhibit	13-2)				LOS = (E	xhibit 13-2)	<u> </u>			
Speed Detern	nination				Speed D	<u>etermin</u> a	tion			
	oit 13-11)				D <sub>s</sub> = (E)	hibit 13-12)				
$M_c = 0.455 (Fxil)$					1		·12)			
	S <sub>R</sub> = 51.8 mph (Exhibit 13-11)									
S <sub>R</sub> = 51.8 mph (					1		-12)			
$S_R = 51.8 \text{ mph } ($ $S_0 = 52.8 \text{ mph } ($	Exhibit 13-11) Exhibit 13-11) Exhibit 13-13)				S <sub>0</sub> = mp	h (Exhibit 13- h (Exhibit 13-				

			MPS AND	RAMP JUN			EET					
General	l Infori	nation			Site Infor	mation						
Analyst		AJR		Fı	eeway/Dir of Tr	avel	I-26 EB					
Agency or C	, ,	Atkin	S		ınction		1210 - EB O	n from PAR				
Date Perform		7/25/			ırisdiction							
Analysis Tin				A	nalysis Year		2038 Build -	River Center Site				
	cription	Navy Base ICT	l <del>l</del>									
nputs			EN	hanafi anaa Ni					1			
Jpstream A	dj Ramp		1 1	ber of Lanes, N	3				Downstre	eam Adj		
			Ramp Number		1				Ramp			
☐ Yes ☐ On			Acceleration L	ane Length, L <sub>A</sub>	1000				☐Yes	On		
✓ No	Off		Deceleration L	ane Length L <sub>D</sub>					✓ No	Off		
			Freeway Volum	ne, V <sub>F</sub>	3259				INO			
- <sub>up</sub> =	ft		Ramp Volume	, V <sub>D</sub>	625				L <sub>down</sub> =	ft		
Freeway Fre				Flow Speed, S <sub>FF</sub>	60.0							
/ = veh/h				55.0				V <sub>D</sub> =	veh/h			
CONVOR	cion to	nc/h Hn/		Conditions								
		<i>γ ρε/π οπ</i>						<u> </u>				
(pc/h	h)	(Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	f <sub>p</sub>	v = V/PH	$F x f_{HV} x f_{p}$		
Freeway		3259	0.90	Level	7	0	0.966	1.00		3748		
Ramp		625	0.90	Level	36	0	0.847	1.00		819		
UpStream												
DownStrea	m											
			Merge Areas			Diverge Areas						
Stimat	tion of	V <sub>12</sub>				Estimation of v <sub>12</sub>						
		V <sub>12</sub> = V <sub>F</sub>	( P <sub>EM</sub> )				\/	<sub>2</sub> = V <sub>R</sub> + (V <sub>F</sub> - V	, /b			
. <sub>EQ</sub> =			ation 13-6 or	13-7)								
) <sub>FM</sub> =				ion (Exhibit 13-6)	١							
/ <sub>12</sub> =		2269		CAMBIE TO O	1	P <sub>FD</sub> = using Equation (Exhibit 13-7)						
				on 13-14 or 13-		$V_{12} = pc/h$						
$V_3$ or $V_{av34}$		17)	pom (Equation	)		$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17) Is $V_3$ or $V_{av34} > 2,700$ pc/h? $\square$ Yes $\square$ No						
ls V <sub>3</sub> or V <sub>av</sub>	, <sub>34</sub> > 2,700	) pc/h? Ye:	s 🗹 No									
		V <sub>12</sub> /2 Ye				Is V <sub>3</sub> or V <sub>av3</sub>	<sub>34</sub> > 1.5 * V <sub>12</sub>	/2 □Yes □No				
f Yes,V <sub>12a</sub> =				-16, 13-18, or		If Yes,V <sub>12a</sub> =		pc/h (Equati	on 13-16, 1	13-18, or		
		13-19)						13-19)				
Capacit	y Che	cks				Capacity	y Check	<u> </u>				
		Actual	C	apacity	LOS F?		Ac		apacity	LOS F?		
						$V_{F}$		Exhibit 13	3-8			
V <sub>F</sub>	_	4567	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>	Exhibit 13	3-8			
F						V <sub>R</sub>		Exhibit 1	3-			
								10				
low Er	ntering		fluence A			Flow En	tering D	iverge Influe				
		Actual		Desirable	Violation?		Actual	_		Violation		
V <sub>R1</sub>		3088	Exhibit 13-8	4600:All	No	V <sub>12</sub>		Exhibit 13-8				
			nination (i			4		Determination	•	t F)		
D <sub>R</sub> =	5.475 +	0.00734 v <sub>R</sub> + 0	0.0078 V <sub>12</sub> - 0.0	0627 L <sub>A</sub>			$D_{R} = 4.252$	+ 0.0086 V <sub>12</sub> -	0.009 L <sub>D</sub>			
D <sub>R</sub> = 22.9 (pc/mi/ln)						$D_R = (p$	c/mi/ln)					
	(Exhibit 1					1	xhibit 13-2	2)				
	,	nination				Speed D		<u></u>				
_								411011				
•	.297 (Exib					,	xhibit 13-12)	. 40)				
• • • • • • • • • • • • • • • • • • • •		Exhibit 13-11)				I ''	ph (Exhibit 13					
0		Exhibit 13-11)				$S_0 = m_1$	ph (Exhibit 13	3-12)				
5 = 55	5.2 mph (	Exhibit 13-13)				S = m <sub>l</sub>	ph (Exhibit 13	3-13)				

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т					
General Information			Site Information						
Analyst Agency or Company Date Performed	AJR Atkins 4/25/2014		Highway/Direction of Trave From/To Jurisdiction	1220 - F	PAR to Heriot				
Analysis Time Period	AM Peak		Analysis Year	2038 Bu Site	uild - River Center				
Project Description Navy	Base ICTF								
✓ Oper.(LOS)			es.(N)	Plar	nning Data				
Flow Inputs									
Volume, V AADT	5611	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 6					
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi					
Calculate Flow Adjus	tments								
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2					
Encod Innuts	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)] 0.971$ Calc Speed Adj and FFS						
Speed Inputs		<u>.</u>	Caic Speed Adj and	ггэ					
Lane Width Rt-Side Lat. Clearance		ft ft							
Number of Lanes, N	3	IL	f <sub>LW</sub>		mph				
Total Ramp Density, TRD	3	ramps/mi	f <sub>LC</sub>		mph				
FFS (measured)	60.0	mph	TRD Adjustment		mph				
Base free-flow Speed, BFFS	00.0	mph	FFS	60.0	mph				
LOS and Performanc	e Measures	5	Design (N)						
<u>Operational (LOS)</u> v <sub>p</sub> = (V or DDHV) / (PHF x I	N x f <sub>HV 2440</sub>	n o /lo /l n	Design (N) Design LOS	Nyf					
x f <sub>p</sub> ) S	2140 54.7	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x x f_p)$	IN X I <sub>HV</sub>	pc/h/ln				
D = v <sub>p</sub> / S	39.1	mph pc/mi/ln	S		mph				
LOS	E	релипли	$D = v_p / S$ Required Number of Lanes	s N	pc/mi/ln				
Glossary			Factor Location						
	C C200	. d	l dotor Location						
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed	BFFS - Ba		$E_R$ - Exhibits 11-10, 11-12 $E_T$ - Exhibits 11-10, 11-11, $f_p$ - Page 11-18 LOS, S, FFS, $v_p$ - Exhibits	11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1				
DDHV - Directional design Copyright © 2012 University of Floric		rved	HCS 2010 <sup>TM</sup> Version 6.41	Gene	rated: 12/9/2014 1:39 F				

BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
		Site Information		
AJR Atkins 4/25/2014		From/To Jurisdiction	1220 - F	PAR to Heriot
PM Peak		Analysis Year	Site	and - Miver Cerner
Base ICTF				
		Des.(N)	Pla	nning Data
3884	veh/h veh/day	%Trucks and Buses, $P_T$	0.90 5	
	veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi	
tments				
1.00		E <sub>R</sub>	1.2	
1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1)] 0.976	
		Calc Speed Adj and	FFS	
	ft			
	ft	f <sub>I W</sub>		mph
3				mph
	ramps/mi	TRD Adjustment		mph
60.0	mph	FFS	60.0	mph
	mph			· 
e Measures	3	Design (N)		
N x f <sub>HV</sub> 1474	pc/h/ln	Design (N) Design LOS v <sub>D</sub> = (V or DDHV) / (PHF x	N x f <sub>HV</sub>	- 1-11-
CO 0	واسوس	x f <sub>p</sub> )		pc/h/ln
	•	s		mph
24.0 C	рс/пп/п	$D = v_p / S$		pc/mi/ln
		<u> </u>	s, N 	
		Factor Location		
D - Dens FFS - Free BFFS - Ba	ity e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11 f <sub>p</sub> - Page 11-18	, 11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1
	AJR Atkins 4/25/2014 PM Peak  Base ICTF  3884  tments 1.00 1.5  3 60.0  e Measures  N x f <sub>HV</sub> 1474 60.0 24.6 C S - Spee D - Dens FFS - Free	AJR Atkins 4/25/2014 PM Peak  Base ICTF  3884 veh/h veh/day  veh/h  tments  1.00 1.5  ft ft ft 3 ramps/mi 60.0 mph mph mph e Measures  N x f <sub>HV</sub> 1474 pc/h/ln 60.0 mph 24.6 pc/mi/ln C  S - Speed D - Density FFS - Free-flow speed BFFS - Base free-flow	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	AJR Atkins Atkins 4/25/2014 Highway/Direction of Travel I-26 EB From/To Jurisdiction 1220 - If Jurisdiction 2038 Bis Site Base ICTF  Des.(N) Plant Peak Analysis Year 2038 Bis Site Base ICTF  Des.(N) Plant Peak Analysis Year 2038 Bis Site Base ICTF  Des.(N) Plant Peak Base IC

HCS 2010<sup>TM</sup> Version 6.41

		RAMP	S AND RAM	P JUNCTI	ONS WO	RKS	HEET						
General Infor	mation			Site Infor	mation								
Analyst	AJR		Fr	eeway/Dir of Tr	avel I	I-26 EE	3						
Agency or Company	Atkir	ns		1230-E	B Off to He	eriot St							
Date Performed		/2014		risdiction									
Analysis Time Period			Ar	alysis Year		2038 B	uild - River	Center Site					
Project Description	Navy Base IC	TF											
nputs		I							1				
Upstream Adj R	lamp	1	ber of Lanes, N	3					Downstre	eam Adj			
	7.0	Ramp Number	of Lanes, N	1					Ramp				
□Yes	On	Acceleration L	ane Length, L <sub>A</sub>						✓ Yes	On			
☑ No □	Off	Deceleration L	ane Length L <sub>D</sub>	200									
E 140	_011	Freeway Volur	ne, V	5611					□No	<b>✓</b> Off			
L <sub>up</sub> = f	t	Ramp Volume	'	726					L <sub>down</sub> =	1400 ft			
up.		1	Flow Speed, S <sub>FF</sub>	55.0									
$V_u = V_v$	eh/h	1							V <sub>D</sub> =	817 veh/h			
2	// //		ow Speed, S <sub>FR</sub>	45.0									
Conversion t	1	der Base (	Conditions		1	_	1		1				
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	$f_p$	V = V/PH	F x f <sub>HV</sub> x f <sub>p</sub>			
Freeway	5611	0.90	Level	6	0	0	971	1.00		6421			
Ramp	726	0.90	Level	5	0			1.00		827			
UpStream	120	0.00	2070.	_	Ť	+ -	0.0	1.00		021			
DownStream	817	0.90	Level	10	0	0.	952	1.00		953			
	1	Merge Areas				1 -		iverge Areas					
Estimation of					Estimati	on o							
	V <sub>12</sub> = V <sub>F</sub>	( D )						\/ (\/ _ \/	\D				
_			40.7)		$V_{12} = V_R + (V_F - V_R)P_{FD}$								
- <sub>EQ</sub> =		ation 13-6 or			$L_{EQ}$ = 1492.19 (Equation 13-12 or 13-13) $P_{FD}$ = 0.566 using Equation (Exhibit 13-7)								
P <sub>FM</sub> =	_	Equation (E	xhibit 13-6)		P <sub>FD</sub> =				uation (Ex	hibit 13-7)			
/ <sub>12</sub> =	pc/h				V <sub>12</sub> =		39	91 pc/h					
/ <sub>3</sub> or V <sub>av34</sub>	pc/h (	(Equation 13-	·14 or 13-17)		$V_3$ or $V_{av34}$		24	30 pc/h (Equ	ation 13-	14 or 13-17)			
Is $V_3$ or $V_{av34} > 2,70$	00 pc/h? 🗌 Ye	s 🗌 No			Is V <sub>3</sub> or V <sub>av3</sub>	<sub>14</sub> > 2,7	00 pc/h? [	]Yes ☑No					
Is V <sub>3</sub> or V <sub>av34</sub> > 1.5	* V <sub>12</sub> /2	es 🗌 No			Is V <sub>3</sub> or V <sub>av3</sub>	<sub>14</sub> > 1.5	* V <sub>12</sub> /2	Yes <b>☑</b> No					
f Yes,V <sub>12a</sub> =			16, 13-18, or		If Yes,V <sub>12a</sub> =		р	c/h (Equation	13-16, 1	3-18, or 13-			
	13-19	)					19	9)					
Capacity Che	1	1		1	Capacity	/ Ch							
	Actual	C	apacity	LOS F?		_	Actual	_	pacity	LOS F?			
					V <sub>F</sub>		6421	Exhibit 13-	6750	No			
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$	- V <sub>R</sub>	5594	Exhibit 13-	6750	No			
					V <sub>R</sub>		827	Exhibit 13-1	0 2100	No			
Flow Entering	a Merge Ir	fluence A	rea		_	terin	a Diver	ge Influen	ce Area	)			
	Actual		Desirable	Violation?	1011	_	Actual	Max Desiral		Violation?			
V <sub>R12</sub>		Exhibit 13-8			V <sub>12</sub>	1 :	3991	Exhibit 13-8	4400:All	No			
evel of Serv	ice Deteri		f not F)					terminatio					
		•			1			0086 V <sub>12</sub> - 0.	-	,			
	* *	0.0070 V <sub>12</sub>	0.00027 L <sub>A</sub>		I			12 ° 0.	003 LD				
D <sub>R</sub> = 5.475 + 0.							$D_R = 36.8 \text{ (pc/mi/ln)}$						
$D_{R} = 5.475 + 0.0$	,					`	oit 13-2)						
$D_R = 5.475 + 0.0$ $D_R = (pc/mi/ln + 0.0)$ $D_R = (Exhibit + 0.0)$	13-2)					4	!4!-						
$D_{R} = 5.475 + 0.0$	13-2)				Speed D	eter	minatio	<u> </u>					
$D_R = 5.475 + 0.0$ $D_R = (pc/mi/ln)$ $D_R = (Exhibit)$ Speed Determine	13-2) <b>nination</b>				<del>                                     </del>		<i>minatio</i> xhibit 13-						
$D_R = 5.475 + 0.0$ $D_R = (pc/mi/ln OS = (Exhibit OS)$ $D_R = (Exhibit OS)$	13-2) <b>mination</b> 3-11)				$D_{s} = 0.3$	372 (E		12)					
$D_{\rm R}$ = 5.475 + 0. $D_{\rm R}$ = (pc/mi/ln .OS = (Exhibit Speed Deterr $M_{\rm S}$ = (Exibit 1: $D_{\rm R}$ = mph (Exh	13-2) mination 3-11) nibit 13-11)				$D_s = 0.3$ $S_R = 50$	372 (E .2 mph	xhibit 13- (Exhibit	12) 13-12)					
$D_{\rm R}$ = 5.475 + 0. $D_{\rm R}$ = (pc/mi/ln $D_{\rm R}$ = (Exhibit Speed Detern $M_{\rm S}$ = (Exibit 1: $M_{\rm S}$ = mph (Exhibit 2: $M_{\rm S}$ = mph (Exhibit 3:	13-2) <b>mination</b> 3-11)				$D_s = 0.3$ $S_R = 50$ $S_0 = 54$	372 (E .2 mph .8 mph	xhibit 13-	12) 13-12) 13-12)					

General In	formation			Site Infor	mation					
Analyst	AJR		Fr	eeway/Dir of Tr		I-26 EE	3			
Agency or Comp				unction			B Off to He	riot St		
Date Performed	,	/2014		urisdiction						
Analysis Time P		Peak	ıA	nalysis Year	2038 Build - River Center Site					
	ion Navy Base IC			7						
Inputs	•									
Upstream A	Adi Ramp	Freeway Num	ber of Lanes, N	3					Downstre	eam Adi
	_	Ramp Numbe	r of Lanes, N	1					Ramp	
□Yes	☐ On	Acceleration I	ane Length, L <sub>A</sub>						✓ Yes	On
✓ No	Off	Deceleration I	ane Length L <sub>D</sub>	200					□No	✓ Off
		Freeway Volu	me, V <sub>F</sub>	3884						_
L <sub>up</sub> =	ft	Ramp Volume	e, V <sub>R</sub>	513					L <sub>down</sub> =	1400 ft
V,, =	veh/h	Freeway Free	-Flow Speed, $S_{\rm FF}$	55.0					V <sub>D</sub> =	373 veh/l
v <sub>u</sub> –	VEII/II	Ramp Free-F	ow Speed, S <sub>FR</sub>	45.0					ט	0.0 10.0.
Conversio	n to pc/h Un	der Base	Conditions							
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	f <sub>p</sub>	v = V/PH	F x f <sub>HV</sub> x f <sub>p</sub>
Freeway	3884	0.90	Level	5	0	0.	.976	1.00		1423
Ramp	513	0.90	Level	6	0	0.	.971	1.00		587
UpStream										
DownStream	373	0.90	Level	18	0	0.	.917	1.00		452
<i></i>		Merge Areas			<b>-</b>			verge Areas		
Estimatior	of v <sub>12</sub>				Estimat	ion o	of V <sub>12</sub>			
	$V_{12} = V_{F}$	(P <sub>FM</sub> )					V <sub>12</sub> =	$V_R + (V_F - V_F)$	R)P <sub>FD</sub>	
L <sub>EQ</sub> =	(Equa	ation 13-6 or	13-7)		L <sub>EQ</sub> =		57	I.16 (Equatio	n 13-12 d	or 13-13)
P <sub>FM</sub> =	using	Equation (I	Exhibit 13-6)		P <sub>FD</sub> =		0.6	22 using Equ	uation (Ex	hibit 13-7)
V <sub>12</sub> =	pc/h	, ,	,		V <sub>12</sub> =			75 pc/h	,	,
√ <sub>3</sub> or V <sub>av34</sub>		/Equation 13	-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>			18 pc/h (Equ	ation 12	14 or 12 17
			-14 01 13-17)			× 0 7			alion 13-	14 01 13-17
	2,700 pc/h? ☐ Ye							Yes ☑No		
Is V <sub>3</sub> or V <sub>av34</sub> >	1.5 * V <sub>12</sub> /2		10 10 10		Is V <sub>3</sub> or V <sub>av</sub>	<sub>/34</sub> > 1.5		Yes ☑ No	40.40.4	
f Yes,V <sub>12a</sub> =	pc/h 13-19		-16, 13-18, or		If Yes,V <sub>12a</sub>	=	ро 19	c/h (Equation	13-16, 1	3-18, or 13-
Capacity C		)			Capacit	v Ch		)		
	Actual	I	apacity	LOS F?		, ,	Actual	Ca	pacity	LOS F3
					V <sub>F</sub>		4423	Exhibit 13-8		
$V_{FO}$		Exhibit 13-8			V <sub>FO</sub> = V <sub>F</sub>	V <sub>D</sub>	3836	Exhibit 13-8	+	No
FU					V <sub>R</sub>		587	Exhibit 13-1	_	
		- <i>C</i> I			- '`					
Flow Enter	ring Merge II Actual	-i	Desirable	Violation?	Flow El	_	Actual	ge Influen  Max Desirab		Violation
V	Actual	Exhibit 13-8	Desirable	Violations	\ \/	$\overline{}$	2975	Exhibit 13-8	4400:All	No
V <sub>R12</sub>	omica Dataw		:f = 04 F)		V <sub>12</sub>					
	ervice Deteri				1			erminatio	_ •	( <b>F</b> )
	+ 0.00734 v <sub>R</sub> +	0.0078 V <sub>12</sub> -	0.00627 L <sub>A</sub>		1			0086 V <sub>12</sub> - 0.	009 L <sub>D</sub>	
							/mi/ln)			
•	ibit 13-2)						bit 13-2)			
Speed Det	ermination				Speed I	Deter	minatio	n		
M <sub>S</sub> = (Exib	oit 13-11)				$D_s = 0$	.351 (E	xhibit 13-	12)		
	Exhibit 13-11)				$S_R = 5$	0.4 mph	n (Exhibit 1	3-12)		
						8.6 mph	(Exhibit 1	(3-12)		
$S_0 = mph($	EXHIDIL 13-11)	$S_0 = 5$		(						
	Exhibit 13-11)				l *		(Exhibit 1			

F-4342

General In	formation	13/3/11/1	S AND RAM	Site Infor									
Analyst	AJR		г.	eeway/Dir of Tr		I-26 EB	)						
Analyst Agency or Comp				nction				t. Pleasant St					
Date Performed	•	5/2014		risdiction		1240-6	.b Oii to ivii	i. Fieasaiii Si					
Analysis Time Pe		Peak		nalysis Year		2038 B	uild - River	Center Site					
	on Navy Base IC		7 (	naryoro i car		2000 D	uliu - IXIVEI	Certier Oile					
nputs	on many base to												
Upstream A	di Ramo	Freeway Num	ber of Lanes, N	3					Downstre	am Adi			
<u>.</u>	_	Ramp Number	of Lanes, N	1					Ramp	a			
☐ Yes ☐ On Acceleration Lane Length, L <sub>A</sub>									□Yes	On			
✓ No	Off	1	ane Length L <sub>D</sub>	175					☑ No	Off			
1 -	u	Freeway Volui Ramp Volume		4885						ft			
L <sub>up</sub> =	ft	817 55.0					L <sub>down</sub> =	10					
V =	V <sub>II</sub> = veh/h Freeway Free-Flow Speed, S <sub>FF</sub>								V <sub>D</sub> =	veh/h			
Ramp Free-Flow Speed, S <sub>FR</sub>				45.0									
conversio	n to pc/h Un	der Base (	Conditions										
(pc/h) V (Veh/hr)		PHF	Terrain	%Truck	%Rv		$f_{HV}$	f <sub>p</sub>	v = V/PHI	$= x f_{HV} x f_{p}$			
reeway	4885	0.90	Level	6	0	0.	971	1.00	5	591			
Ramp	817	0.90	Level	10	0	0.	952	1.00	Ç	953			
JpStream													
DownStream		Manna Anana			-			N					
stimation	of v	Merge Areas			Diverge Areas  Estimation of v <sub>12</sub>								
- Stilliation	·-	(D.)			· <del>-</del>								
	$V_{12} = V_{F}$				$V_{12} = V_R + (V_F - V_R)P_{FD}$								
EQ =		ation 13-6 or			L <sub>EQ</sub> = (Equation 13-12 or 13-13)								
) <sub>FM</sub> =	using	g Equation (E	Exhibit 13-6)		P <sub>FD</sub> =		0.	576 using Equ	uation (Ext	nibit 13-7)			
12 =	pc/h				V <sub>12</sub> =		36	626 pc/h					
<sub>3</sub> or V <sub>av34</sub>	pc/h	(Equation 13-	-14 or 13-17)		$V_3$ or $V_{av34}$		19	965 pc/h (Equ	ation 13-1	4 or 13-17			
s V <sub>3</sub> or V <sub>av34</sub> >	2,700 pc/h? ☐ Y∈	es 🗌 No			Is V <sub>3</sub> or V <sub>av</sub>	<sub>34</sub> > 2,7	00 pc/h?	☐ Yes ☑ No					
s V <sub>3</sub> or V <sub>av34</sub> >	1.5 * V <sub>12</sub> /2 Ye	es 🗌 No			Is V <sub>3</sub> or V <sub>av</sub>	<sub>34</sub> > 1.5	* V <sub>12</sub> /2	☐Yes ☑ No					
Yes,V <sub>12a</sub> =	pc/h	(Equation 13-	-16, 13-18, or		If Yes,V <sub>12a</sub> =			c/h (Equation	13-16, 13	3-18, or 13			
	13-19	)						9)					
Capacity C				1	Capacit	y Che				1.005			
	Actual		apacity	LOS F?	V <sub>F</sub>		Actual	Exhibit 13-8	pacity 6750	LOS F			
		F 1 11 11 40 0				\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	5591			No			
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$	- V <sub>R</sub>	4638	Exhibit 13-8		No			
					V <sub>R</sub> 953		Exhibit 13-1	No					
low Enter	ring Merge II			1	Flow En	_		rge Influen					
	Actual		Desirable	Violation?	.,		Actual	Max Desirab		Violation'			
V <sub>R12</sub>		Exhibit 13-8			V <sub>12</sub>		3626	Exhibit 13-8	4400:All	No			
Level of Service Determination (if not F)  D <sub>R</sub> = 5.475 + 0.00734 v <sub>R</sub> + 0.0078 V <sub>12</sub> - 0.00627 L <sub>A</sub>						Level of Service Determination (if not F)							
		0.0078 V <sub>12</sub> -	0.00627 L <sub>A</sub>		1	$D_R = 4$	1.252 + 0	.0086 V <sub>12</sub> - 0.	009 L <sub>D</sub>				
						$D_R = 33.9 \text{ (pc/mi/ln)}$							
`	bit 13-2)					<u> </u>	oit 13-2)						
	ermination				Speed L	Deter	minatio	on					
Speed Det	•						xhibit 13-	-12)					
							$D_s = 0.384$ (Exhibit 13-12) $S_R = 50.0$ mph (Exhibit 13-12)						
1 <sub>S</sub> = (Exib	,				OR- O								
$M_{\rm S} = $ (Exib	Exhibit 13-11)				1		•	•					
$M_S = $ (Exib $M_R = $ mph (I $M_S = $ mph (I	,				S <sub>0</sub> = 56	6.6 mph	•	13-12)					

F-4343

General Info	ormation	1 1/7/11/11	S AND RAM	Site Infor						
			F.			LOGER				
Analyst	AJR Addisin			Freeway/Dir of Travel		1-26 EB	Off to Mt	Diagont Ct		
Agency or Compa Date Performed	•	ns /2014		ınction ırisdiction		124U-Et	o Uπ to IVIt.	Pleasant St		
						2020 D.	المال المال	Comton Cito		
nalysis Time Per	riod PM F on Navy Base IC		Al	nalysis Year		2030 BL	ilia - River (	Center Site		
nputs	II Navy base IC	11								
•	l' D	Freeway Num	ber of Lanes, N	3					Dannataa	A al:
Upstream Ad	ıj Kamp	Ramp Numbe		1					Downstreated Ramp	am Auj
☐Yes	On	l '	ane Length, L	,						
_	_	1	ane Length L	175					Yes	On
✓ No	☐ Off	1							✓ No	Off
	r.	Freeway Volu		3371					l =	ft
L <sub>up</sub> =	ft	Ramp Volume	11	373					L <sub>down</sub> =	11
V,, =	veh/h	Freeway Free	-Flow Speed, S <sub>FF</sub>	55.0					V <sub>D</sub> =	veh/h
v <sub>u</sub> –	VEII/II	Ramp Free-Fl	ow Speed, S <sub>FR</sub>	45.0					D	
Conversion	to pc/h Un	der Base (	Conditions							
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f	HV	f <sub>p</sub>	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>
reeway	3371	0.90	Level	5	0	0.9	76	1.00	38	39
Ramp	373	0.90	Level	18	0	0.9		1.00		52
JpStream		0.00	20101	10	Ť	- 0.0		1.00		-
DownStream										
		Merge Areas						verge Areas		
stimation	of v <sub>12</sub>				Estimation of v <sub>12</sub>					
	V <sub>12</sub> = V <sub>F</sub>	( P <sub>EM</sub> )					V <sub>12</sub> =	V <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>	)P <sub>ED</sub>	
EQ =		ation 13-6 or	13-7)		L <sub>EQ</sub> = (Equation 13-12 or 13-13)					
		Equation (E			P <sub>FD</sub> = 0.643 using Equation (Exhibit 13-7)					
/ <sub>FM</sub> = / <sub>12</sub> =	pc/h	Equation (E			V <sub>12</sub> =				iation (EXII	DIL 13-1)
	•	(Caucation 40	44 40 47)					31 pc/h	40 4	4 40 47
or V <sub>av34</sub>			-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>	0.70		)8 pc/h (Equa	ation 13-14	4 or 13-17
	2,700 pc/h? ☐ Ye							Yes ☑ No		
ls V <sub>3</sub> or V <sub>av34</sub> > 1	.5 * V <sub>12</sub> /2 Ye		10 10 10					Yes ☑ No	10 10 10	
Yes,V <sub>12a</sub> =	pc/h ( 13-19)	` '	-16, 13-18, or		If Yes,V <sub>12a</sub> =	:	рс 19	c/h (Equation	13-16, 13	-18, or 13
Capacity Cl		)			Capacity			)		
rapacity of	Actual		apacity	LOS F?		) 0110	Actual	Cal	pacity	LOS F
	7 (01.00)	<del>† i</del>	apaony	2001.	V <sub>F</sub>		3839	Exhibit 13-8	1	No
		Fubibit 12.0				\/		-	-	_
		Exhibit 13-8			$V_{FO} = V_{F}$	- v <sub>R</sub>	3387	Exhibit 13-8		No
$V_{FO}$	<b>I</b>				1 \/	- 1	452	Exhibit 13-10	2100	No
					V <sub>R</sub>					
	ing Merge In			1				ge Influen		
Flow Enteri	ing Merge In	Max	<b>Irea</b> Desirable	Violation?	Flow En	A	ctual	Max Desirab	le	Violation'
Flow Enteri	Actual	Max Exhibit 13-8	Desirable	Violation?	Flow En	A 2	ctual 631	Max Desirab Exhibit 13-8	le 4400:All	No
V <sub>R12</sub>	Actual  rvice Deterr	Max Exhibit 13-8	Desirable  if not F)	Violation?	Flow En	A 2	ctual 631	Max Desirab	le 4400:All	No
V <sub>R12</sub>	Actual	Max Exhibit 13-8	Desirable  if not F)	Violation?	Flow En  V <sub>12</sub> Level of	2 Serv	ctual 631 <b>ice Det</b>	Max Desirab Exhibit 13-8	le 4400:All <b>n (if not</b>	No
Flow Enterior $V_{R12}$ <b>.evel of Se</b> $D_{R} = 5.475 + 40$	rvice Determ 0.00734 v <sub>R</sub> +	Max Exhibit 13-8	Desirable  if not F)	Violation?	V <sub>12</sub> Level of	2 Serv	ctual 631 <b>ice Det</b> 252 + 0.0	Max Desirab Exhibit 13-8 <b>erminatio</b>	le 4400:All <b>n (if not</b>	No
Flow Enterior $V_{R12}$ Level of Set $D_R = 5.475 + 0.00$ $C_R = 0.00$ $C_R = 0.00$	rvice Determ 0.00734 v <sub>R</sub> +	Max Exhibit 13-8	Desirable  if not F)	Violation?	Flow En  V <sub>12</sub> Level of  D <sub>R</sub> = 25	20 Serv D <sub>R</sub> = 4.5.3 (pc/s	ctual 631 <b>ice Det</b> 252 + 0.0 mi/ln)	Max Desirab Exhibit 13-8 <b>erminatio</b>	le 4400:All <b>n (if not</b>	No
Flow Enterior $V_{R12}$ Level of Set $D_R = 5.475 + C_R = (pc/mi)$ OS = (Exhibit	Actual  rvice Deterr  0.00734 v <sub>R</sub> +  i/ln)  oit 13-2)	Max Exhibit 13-8	Desirable  if not F)	Violation?	V <sub>12</sub> Level of  D <sub>R</sub> = 25 LOS = C	$\begin{array}{c} A \\ 2 \\ C \\ D_R = 4 \\ 6.3 \text{ (pc/s)} \end{array}$	ctual 631 ice Det 252 + 0.0 mi/ln) it 13-2)	Max Desirab Exhibit 13-8 <b>ermination</b> 0086 V <sub>12</sub> - 0.0	le 4400:All <b>n (if not</b>	No
Flow Enterior $V_{R12}$ Level of Set $D_R = 5.475 + 0$ $O_R = (pc/mi)$ $O_R = (Exhib)$ Speed Dete	Actual  rvice Determ  0.00734 v <sub>R</sub> +  i/ln)  oit 13-2)  ermination	Max Exhibit 13-8	Desirable  if not F)	Violation?	V <sub>12</sub> Level of  D <sub>R</sub> = 25 LOS = C Speed D	A $20$ $C$	ctual 631 ice Det 252 + 0.0 mi/ln) it 13-2) mination	Max Desirab Exhibit 13-8  ermination 0086 V <sub>12</sub> - 0.0	le 4400:All <b>n (if not</b>	No
Flow Enterior $V_{R12}$ Level of Selection $D_R = 5.475 + 4.00$ $C_R = C_R = C_$	Actual  rvice Deterr  0.00734 v <sub>R</sub> +  i/ln)  oit 13-2)  ermination  t 13-11)	Max Exhibit 13-8	Desirable  if not F)	Violation?	V <sub>12</sub> Level of  D <sub>R</sub> = 25 LOS = C Speed D D <sub>s</sub> = 0.3	A 20 F Serv D <sub>R</sub> = 4.5.3 (pc/o (Exhib) Deterr 339 (Ex	ctual 631 ice Det 252 + 0.0 mi/ln) it 13-2) mination chibit 13-1	Max Desirab Exhibit 13-8  ermination 0086 V <sub>12</sub> - 0.0	le 4400:All <b>n (if not</b>	No
Flow Enterior $V_{R12}$ Level of Set $D_R = 5.475 + 0$ $D_R =	Actual  rvice Determ 0.00734 v R + i/ln) bit 13-2) ermination t 13-11) Exhibit 13-11)	Max Exhibit 13-8	Desirable  if not F)	Violation?	Flow En $V_{12}$ Level of $D_R = 25$ $LOS = C$ Speed D $D_S = 0.3$ $S_R = 50$	20 Serv D <sub>R</sub> = 4.5.3 (pc/n (Exhib) Deterr 339 (Exhib) 0.6 mph	ctual 631 ice Det 252 + 0.0 mi/ln) it 13-2) mination thibit 13-1 (Exhibit 1	Max Desirab Exhibit 13-8 <b>ermination</b> 0086 V <sub>12</sub> - 0.0 <b>n</b> 12) 13-12)	le 4400:All <b>n (if not</b>	No
Flow Enterior $V_{R12}$ Level of Selection $D_R = 5.475 + 0$ $D_R = 0$	Actual  rvice Deterr  0.00734 v <sub>R</sub> +  i/ln)  oit 13-2)  ermination  t 13-11)	Max Exhibit 13-8	Desirable  if not F)	Violation?	V <sub>12</sub> Level of  [D <sub>R</sub> = 25 LOS = C Speed D S <sub>R</sub> = 50 S <sub>R</sub> = 50 S <sub>0</sub> = 59	A 20 F Serv D <sub>R</sub> = 4 5.3 (pc/n (Exhib) Deterr 339 (Ex 0.6 mph	ctual 631 ice Det 252 + 0.0 mi/ln) it 13-2) mination chibit 13-1	Max Desirab Exhibit 13-8  ermination 0086 V <sub>12</sub> - 0.0  n 12) 3-12)	le 4400:All <b>n (if not</b>	

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#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description:

7/25/2014 2038 Build-River Center Site AM Peak

Navy Base ICTF

Freeway/Direction Junction Segment ID

I-26 EB EB Off to US-17 NB

1250

#### Inputs

	Freeway Upstream of Ramp	Freeway Downstream of Ramp	Ramp
Number of Lanes, N	3	2	1
Free-Flow Speed, FFS (mph)	55	55	55
Volume, V (veh/h)	4,068	2,592	1,476
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, $P_T$	5%	7%	4%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Freeway Upstream Ramp	Freeway Downstream Ramp	Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.98	0.97	0.98
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	1,544	1,490	1,673
Capacity Flow Rate, c (pc/h/ln)	2,250	2,250	2,200
v/c ratio	0.69	0.66	0.76
Density, D <sub>MD</sub> (pc/mi/ln)	27.0	26.1	29.3
LOS	С	С	D

#### Formulas and Reference Material

 $f_{HV} =$ 

 $1 + P_T(E_T-1) + P_R(E_R-1)$ 

HCM 2010, Equation 11-3

 $PHF^*N^*f_{HV}^*f_P$ 

HCM 2010, Equation 11-2

 $D_{MD} =$ 

 $0.0175*v_{f}$ Ν

HCM 2010, Equation 13-26

**Basic Freeway Segments** Max Service Flow Rates

	Capacity
FFS (mi/h)	(pc/h/ln)
75	2,400
70	2,400
65	2,350
60	2,300
55	2,250

Source: HCM 2010, Exhibit 11-17

Ramp Roadways Max Service Flow Rates

	Capacity
FFS (mi/h)	(pc/h/ln)
> 50	2,200
>40-50	2,100
>30-40	2,000
≥20-30	1,900
<20	1,800

Source: HCM 2010, Exhibit 13-10

Diverge LOS Thresholds

	Density
LOS	(pc/mi/ln)
Α	≤10
В	>10-20
С	>20-28
D	>28-35
Е	>35
F	v/c > 1

#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2038 Build-River Center Site PM Peak Freeway/Direction Junction Segment ID I-26 EB EB Off to US-17 NB 1250

Navy Base ICTF

### Inputs

	Freeway Upstream of Ramp	Freeway Downstream of Ramp	Ramp
Number of Lanes, N	3	2	1
Free-Flow Speed, FFS (mph)	55	55	55
Volume, V (veh/h)	2,998	2,234	764
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	5%	5%	7%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Freeway Upstream Ramp	Freeway Downstream Ramp	Ramp
Heavy Vehicle Adjustment Factor, $f_{\text{HV}}$	0.98	0.98	0.97
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	1,138	1,272	879
Capacity Flow Rate, c (pc/h/ln)	2,250	2,250	2,200
v/c ratio	0.51	0.57	0.40
Density, D <sub>MD</sub> (pc/mi/ln)	19.9	22.3	15.4
LOS	В	C	В

#### Formulas and Reference Material

$$f_{HV} =$$

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

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HCM 2010, Equation 11-2

 $D_{MD} =$ 

0.0175\*v<sub>f</sub> N

HCM 2010, Equation 13-26

Basic Freeway Segments Max Service Flow Rates

	Capacity
FFS (mi/h)	(pc/h/ln)
75	2,400
70	2,400
65	2,350
60	2,300
55	2,250

Source: HCM 2010, Exhibit 11-17

Ramp Roadways Max Service Flow Rates

	Capacity
FFS (mi/h)	(pc/h/ln)
> 50	2,200
>40-50	2,100
>30-40	2,000
≥20-30	1,900
<20	1,800

Diverge LOS Thresholds

	Density
LOS	(pc/mi/ln)
Α	≤10
В	>10-20
С	>20-28
D	>28-35
Е	>35
F	v/c > 1

Source: HCM 2010, Exhibit 13-10

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	T	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>I-26 EB</i>	
Agency or Company	Atkins		From/To	1260 - U	US17 NB to Cypress
Date Performed	7/25/2014		Jurisdiction	St	
Analysis Time Period	AM Peak		Analysis Year	2038 Bu Site	uild - River Center
Project Description Navy	Base ICTF			Oile	
✓ Oper.(LOS)			Des.(N)	Plar	nning Data
Flow Inputs			. ,		
Volume, V AADT	2592	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 7	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments				
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] 0.966	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f <sub>LW</sub>		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	55.0	mph	FFS	55.0	mph
Base free-flow Speed, BFFS		mph		00.0	трп
LOS and Performance	o Moasuros	<u> </u>	Design (N)		
Loo and renormane	c Mcasarcs	•			
Operational (LOS)			Design (N) Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x )$	V x f <sub>HV 1400</sub>	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N v f	
x f <sub>p</sub> )	1490	рслілії	l r	'\^'HV	pc/h/ln
S	55.0	mph	x f <sub>p</sub> ) S		mph
$D = v_p / S$	27.1	pc/mi/ln			pc/mi/ln
LOS	D		$D = v_p / S$ Required Number of Lanes	s. N	ролпип
Glossary			Factor Location	,	
N - Number of lanes	S - Spee	ed			
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12	44.40	f <sub>LW</sub> - Exhibit 11-8
v <sub>n</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18	44.0	TRD - Page 11-11
speed			LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	
DDHV - Directional design	hour volume		11-3		

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>I-26 EB</i>	
Agency or Company	Atkins		From/To	1260 - U St	JS17 NB to Cypress
Date Performed	7/25/2014		Jurisdiction	Οί	
Analysis Time Period	PM Peak		Analysis Year	2038 Bu Site	ıild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	☐Plar	nning Data
Flow Inputs					
Volume, V AADT	2234	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 5	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length	Level mi	
			Up/Down %		
Calculate Flow Adjus	tments				
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] 0.976	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	55.0	mph	FFS	55.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performanc	e Measures	5	Design (N)		
0			Design (N)		
Operational (LOS)	NI v. £		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x I x f_p)$	10 X I <sub>HV</sub> 1272	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	$N \times f_{HV}$	pc/h/ln
S 'p'	55.0	mph	x f <sub>p</sub> )		роліліі
D = v <sub>p</sub> / S	23.1	pc/mi/ln	S		mph
LOS	23.1 C	рс/пп/п	$D = v_p / S$		pc/mi/ln
	O		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed	E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens	ity	$E_{\rm T}$ - Exhibits 11-10, 11-11,		f <sub>IC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate	FFS - Free	e-flow speed	$f_{\rm n}$ - Page 11-18	11-10	TRD - Page 11-11
LOS - Level of service	BFFS - Ba	ase free-flow	LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2	IND - Faye 11-11
speed	hour volume		11-3	11-4,	
DDHV - Directional design	nour volume		1		

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#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2038 Build-River Center Site AM Peak Navy Base ICTF Freeway/Direction Junction Segment ID

I-26 EB EB On from Cypress St 1270

Inputs

	Freeway Upstream of Ramp	Freeway Downstream of Ramp	Ramp
Number of Lanes, N	2	3	1
Free-Flow Speed, FFS (mph)	55	55	45
Volume, V (veh/h)	2,592	2,711	119
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	7%	6%	14%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Freeway Upstream Ramp	Freeway Downstream Ramp	Ramp
Heavy Vehicle Adjustment Factor, $f_{\rm HV}$	0.97	0.97	0.93
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	1,490	1,034	141
Capacity Flow Rate, c (pc/h/ln)	2,250	2,250	2,100
v/c ratio	0.66	0.46	0.07
Density, D <sub>MD</sub> (pc/mi/ln)	26.1	18.1	2.5
LOS	С	В	Α

#### Formulas and Reference Material

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

V. =

HCM 2010, Equation 11-2

 $D_{MD} =$ 

0.0175\*v<sub>f</sub> N

HCM 2010, Equation 13-26

Basic Freeway Segments Max Service Flow Rates

	Capacity
FFS (mi/h)	(pc/h/ln)
75	2,400
70	2,400
65	2,350
60	2,300
55	2,250

Source: HCM 2010, Exhibit 11-17

Ramp Roadways Max Service Flow Rates

	Capacity
FFS (mi/h)	(pc/h/ln)
> 50	2,200
>40-50	2,100
>30-40	2,000
≥20-30	1,900
<20	1,800

Source: HCM 2010, Exhibit 13-10

Diverge LOS Thresholds

	Density	
LOS	(pc/mi/ln)	
Α	≤10	
В	>10-20	
С	>20-28	
D	>28-35	
E	>35	
F	v/c > 1	

#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2038 Build-River Center Site PM Peak Navy Base ICTF Freeway/Direction Junction Segment ID I-26 EB EB On from Cypress St 1270

Inputs

	Freeway Upstream of Ramp	Freeway Downstream of Ramp	Ramp
Number of Lanes, N	2	3	1
Free-Flow Speed, FFS (mph)	55	55	45
Volume, V (veh/h)	2,234	2,435	201
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	5%	4%	7%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Freeway Upstream Ramp	Freeway Downstream Ramp	Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.98	0.98	0.97
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	1,272	920	231
Capacity Flow Rate, c (pc/h/ln)	2,250	2,250	2,100
v/c ratio	0.57	0.41	0.11
Density, D <sub>MD</sub> (pc/mi/ln)	22.3	16.1	4.0
LOS	С	В	А

#### Formulas and Reference Material

 $\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$ 

HCM 2010, Equation 11-3

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V PHF\*N\*f<sub>HV</sub>\*f<sub>P</sub>

HCM 2010, Equation 11-2

 $D_{MD} =$ 

0.0175\*v<sub>f</sub> N

HCM 2010, Equation 13-26

Basic Freeway Segments Max Service Flow Rates

	Capacity
FFS (mi/h)	(pc/h/ln)
75	2,400
70	2,400
65	2,350
60	2,300
55	2,250

Source: HCM 2010, Exhibit 11-17

Ramp Roadways Max Service Flow Rates

	Capacity	
FFS (mi/h)	(pc/h/ln)	
> 50	2,200	
>40-50	2,100	
>30-40	2,000	
≥20-30	1,900	
<20	1,800	

Diverge LOS Thresholds

	Density	
LOS	(pc/mi/ln)	
Α	≤10	
В	>10-20	
С	>20-28	
D	>28-35	
Е	>35	
F	v/c > 1	

Source: HCM 2010, Exhibit 13-10

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed	AJR Atkins 7/25/2014		Highway/Direction of Trave From/To Jurisdiction	1280 - E	East Of Cypress
Analysis Time Period	AM Peak		Analysis Year	Site	
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	2711	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 6	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1)] 0.971	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	3		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	55.0	mph	FFS	55.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performanc	e Measures	3	Design (N)		
Operational (LOS)  v <sub>p</sub> = (V or DDHV) / (PHF x I	N x f <sub>HV</sub> 1034	pc/h/ln	Design (N) Design LOS v <sub>p</sub> = (V or DDHV) / (PHF x	N x f <sub>HV</sub>	n a /h // n
x f <sub>p</sub> )	<i>EE</i> 0	mnh	x f <sub>p</sub> )		pc/h/ln
S D=v /S	55.0 18.8	mph nc/mi/ln	s		mph
D = v <sub>p</sub> / S LOS	18.8 C	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	O		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed DDHV - Directional design	BFFS - Ba		E <sub>R</sub> - Exhibits 11-10, 11-12 E <sub>T</sub> - Exhibits 11-10, 11-11, f <sub>p</sub> - Page 11-18 LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1

HCS 2010<sup>TM</sup> Version 6.41

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		Site Information		
AJR Atkins 7/25/2014		Highway/Direction of Trave From/To Jurisdiction	1280 - E	East Of Cypress
PM Peak		Analysis Year	Site	and raver conten
Base ICTF				
		Des.(N)	Plar	nning Data
2435	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 4	
	veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi	
tments				
1.00		E <sub>R</sub>	1.2	
1.5				
		Calc Speed Adj and	FFS	
	ft			
	ft	$f_{LW}$		mph
3		$f_{LC}$		mph
	ramps/mi	TRD Adjustment		mph
55.0	mph	FFS	55.0	mph
	mph			· 
e Measures	5	Design (N)		
N x f <sub>HV</sub> 920	pc/h/ln	Design (N) Design LOS v <sub>p</sub> = (V or DDHV) / (PHF x	N x f <sub>HV</sub>	no/h/ln
55 O	mnh	x f <sub>p</sub> )		pc/h/ln
	•	S		mph
16.7 B	рс/пп/п	$D = v_p / S$		pc/mi/ln
		<u> </u>	s, N 	
		Factor Location		
D - Dens FFS - Free BFFS - Ba	sity e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11, f <sub>p</sub> - Page 11-18	11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-11
	7/25/2014 PM Peak Base ICTF  2435  tments 1.00 1.5  3 55.0  Measures N x f <sub>HV</sub> 920 55.0 16.7 B  S - Speed D - Dens FFS - Free	7/25/2014 PM Peak  Base ICTF  2435	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$

HCS 2010<sup>TM</sup> Version 6.41

#### **General Information**

Date Performed: Analysis Year Analysis Time Period: 7/25/2014 2038 Build-River Center Site AM Peak Freeway/Direction
Junction
Segment ID

I-26 WB WB Off to US-17 NB 2010

Project Description: Navy Base ICTF

### Inputs

	Freeway Upstream of Ramp	Freeway Downstream of Ramp	Ramp
Number of Lanes, N	4	3	2
Free-Flow Speed, FFS (mph)	55	55	55
Volume, V (veh/h)	3,513	1,435	2,078
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	5%	5%	4%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Freeway Upstream Ramp	Freeway Downstream Ramp	Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.98	0.98	0.98
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	1,000	545	1,178
Capacity Flow Rate, c (pc/h/ln)	2,250	2,250	2,200
v/c ratio	0.44	0.24	0.54
Density, D <sub>MD</sub> (pc/mi/ln)	17.5	9.5	20.6
LOS	В	A	С

#### Formulas and Reference Material

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

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HCM 2010, Equation 11-2

 $D_{MD} =$ 

0.0175\*v<sub>f</sub> N

HCM 2010, Equation 13-26

Basic Freeway Segments Max Service Flow Rates

	Capacity
FFS (mi/h)	(pc/h/ln)
75	2,400
70	2,400
65	2,350
60	2,300
55	2,250

Source: HCM 2010, Exhibit 11-17

Ramp Roadways Max Service Flow Rates

	Capacity
FFS (mi/h)	(pc/h/ln)
> 50	2,200
>40-50	2,100
>30-40	2,000
≥20-30	1,900
<20	1,800

Diverge LOS Thresholds

	Density
LOS	(pc/mi/ln)
Α	≤10
В	>10-20
С	>20-28
D	>28-35
Е	>35
F	v/c > 1

Source: HCM 2010, Exhibit 13-10

#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description:

7/25/2014 2038 Build-River Center Site PM Peak Navy Base ICTF

Freeway/Direction Junction Segment ID

I-26 WB WB Off to US-17 NB 2010

#### Inputs

	Freeway Upstream of Ramp	Freeway Downstream of Ramp	Ramp
Number of Lanes, N	4	3	2
Free-Flow Speed, FFS (mph)	55	55	55
Volume, V (veh/h)	4,428	2,172	2,256
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	4%	4%	3%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Freeway Upstream Ramp	Freeway Downstream Ramp	Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.98	0.98	0.99
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	1,255	821	1,272
Capacity Flow Rate, c (pc/h/ln)	2,250	2,250	2,200
v/c ratio	0.56	0.36	0.58
Density, D <sub>MD</sub> (pc/mi/ln)	22.0	14.4	22.3
LOS	С	В	С

#### Formulas and Reference Material

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

HCM 2010, Equation 11-2

 $D_{MD} =$ 

Capacity

HCM 2010, Equation 13-26

**Basic Freeway Segments** Max Service Flow Rates

	Capacity
FFS (mi/h)	(pc/h/ln)
75	2,400
70	2,400
65	2,350
60	2,300
55	2,250

Source: HCM 2010, Exhibit 11-17

(pc/h/ln) FFS (mi/h) > 50 2,200 >40-50 2,100 >30-40 2,000 1,900 ≥20-30 <20 1,800

Ramp Roadways Max

Service Flow Rates

Source: HCM 2010, Exhibit 13-10

Diverge LOS Thresholds

	Density
LOS	(pc/mi/ln)
Α	≤10
В	>10-20
С	>20-28
D	>28-35
Е	>35
F	v/c > 1

#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 3/20/2014 2038 Build-River Center Site AM Peak Navy Base ICTF Freeway/Direction Junction Segment ID I-26 WB WB Off to Romney St 2020

Inputs

	Freeway Upstream of Ramp	Freeway Downstream of Ramp	Ramp
Number of Lanes, N	3	2	1
Free-Flow Speed, FFS (mph)	55	55	45
Volume, V (veh/h)	1,435	1,205	230
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	5%	5%	5%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Freeway Upstream Ramp	Freeway Downstream Ramp	Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.98	0.98	0.98
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	545	686	262
Capacity Flow Rate, c (pc/h/ln)	2,250	2,250	2,100
v/c ratio	0.24	0.30	0.12
Density, D <sub>MD</sub> (pc/mi/ln)	9.5	12.0	4.6
LOS	Α	В	A

#### Formulas and Reference Material

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

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HCM 2010, Equation 11-2

 $D_{MD} =$ 

HCM 2010, Equation 13-26

Basic Freeway Segments Max Service Flow Rates

	Capacity
FFS (mi/h)	(pc/h/ln)
75	2,400
70	2,400
65	2,350
60	2,300
55	2,250

Source: HCM 2010, Exhibit 11-17

Ramp Roadways Max Service Flow Rates

	Capacity
FFS (mi/h)	(pc/h/ln)
> 50	2,200
>40-50	2,100
>30-40	2,000
≥20-30	1,900
<20	1,800

Diverge LOS Thresholds

	Density	
LOS	(pc/mi/ln)	
Α	≤10	
В	>10-20	
С	>20-28	
D	>28-35	
Е	>35	
F	v/c > 1	

Source: HCM 2010, Exhibit 13-10

#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2038 Build-River Center Site PM Peak Navy Base ICTF Freeway/Direction Junction Segment ID I-26 WB WB Off to Romney St 2020

Inputs

	Freeway Upstream of Ramp	Freeway Downstream of Ramp	Ramp
Number of Lanes, N	3	2	1
Free-Flow Speed, FFS (mph)	55	55	45
Volume, V (veh/h)	2,172	2,021	151
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	4%	4%	7%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Freeway Upstream Ramp	Freeway Downstream Ramp	Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.98	0.98	0.97
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	821	1,145	174
Capacity Flow Rate, c (pc/h/ln)	2,250	2,250	2,100
v/c ratio	0.36	0.51	0.08
Density, D <sub>MD</sub> (pc/mi/ln)	14.4	20.0	3.0
LOS	В	В	Α

#### Formulas and Reference Material

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

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HCM 2010, Equation 11-2

 $D_{MD} =$ 

0.0175\*v<sub>f</sub> N

HCM 2010, Equation 13-26

Basic Freeway Segments Max Service Flow Rates

	Capacity
FFS (mi/h)	(pc/h/ln)
75	2,400
70	2,400
65	2,350
60	2,300
55	2,250

Source: HCM 2010, Exhibit 11-17

Ramp Roadways Max Service Flow Rates

	Capacity
FFS (mi/h)	(pc/h/ln)
> 50	2,200
>40-50	2,100
>30-40	2,000
≥20-30	1,900
<20	1,800

Diverge LOS Thresholds

Density

	Density		
LOS	(pc/mi/ln)		
Α	≤10		
В	>10-20		
С	>20-28		
D	>28-35		
Е	>35		
F	v/c > 1		

Source: HCM 2010, Exhibit 13-10

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	T	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>I-26 WE</i>	3
Agency or Company	Atkins		From/To	2025- R	Romney Off to US17
Date Performed	7/25/2014		Jurisdiction	SB On	
Analysis Time Period	AM Peak		Analysis Year	2038 Bu Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Pla	nning Data
Flow Inputs					
Volume, V AADT	1205	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 5	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments				
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] <i>0.976</i>	
Speed Inputs			Calc Speed Adj and		
Lane Width		ft	,		
Rt-Side Lat. Clearance		ft	f <sub>LW</sub>		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		•
FFS (measured)	55.0	mph			mph
Base free-flow Speed,	00.0	•	FFS	55.0	mph
BFFS		mph			
LOS and Performanc	e Measures	5	Design (N)		
Operational (LOC)			Design (N)		
Operational (LOS)	N v f		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x)$	<sup>11 X 1</sup> HV 686	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	
x f <sub>p</sub> )	55.0	usa usa la	x f <sub>p</sub> )		pc/h/ln
5	55.0	mph	s		mph
$D = v_p / S$	12.5	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	В		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed			f Evhibit 44.0
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>n</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18	44.0	TRD - Page 11-11
speed			LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	
DDHV - Directional design	hour volume		11-3		

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	2025- R SB On	omney Off to US17
Date Performed	7/25/2014		Jurisdiction	OD OII	
Analysis Time Period	PM Peak		Analysis Year	2038 Bu Site	ild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plar	ning Data
Flow Inputs					
Volume, V AADT	2021	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 4	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D		1- //-	General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments				
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.980	
Speed Inputs		Calc Speed Adj and FFS			
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	55.0	mph	FFS	55.0	mph
Base free-flow Speed,		mph		33.0	прп
BFFS	. 14		Desire (N)		
LOS and Performanc	e Measures	<u> </u>	Design (N)		
Operational (LOS)			Design (N)		
$v_p = (V \text{ or DDHV}) / (PHF x I)$	N x f <sub>uv</sub>		Design LOS		
x f <sub>p</sub> )	'' <sup>v</sup> 1145	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	pc/h/ln
S	55.0	mph	x f <sub>p</sub> )		•
$D = v_p / S$	20.8	pc/mi/ln	S		mph
Los	С	•	$D = v_p / S$		pc/mi/ln
			Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
V - Hourly volume	D - Dens	-	E <sub>T</sub> - Exhibits 11-10, 11-11,		f <sub>LC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate		e-flow speed	f <sub>p</sub> - Page 11-18		TRD - Page 11-11
LOS - Level of service speed	RFFS - Ba	ase free-flow	LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	J
DDHV - Directional design	hour volume		11-3		
			1		

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#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2038 Build-River Center Site AM Peak Navy Base ICTF Freeway/Direction Junction Segment ID I-26 WB WB On from US-17 SB 2030

Inputs

	Freeway Upstream of Ramp	Freeway Downstream of Ramp	Ramp
Number of Lanes, N	2	3	1
Free-Flow Speed, FFS (mph)	55	55	55
Volume, V (veh/h)	1,205	2,473	1,268
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	5%	6%	7%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Freeway Upstream Ramp	Freeway Downstream Ramp	Ramp
Heavy Vehicle Adjustment Factor, $f_{\rm HV}$	0.98	0.97	0.97
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	686	943	1,458
Capacity Flow Rate, c (pc/h/ln)	2,250	2,250	2,200
v/c ratio	0.30	0.42	0.66
Density, D <sub>MD</sub> (pc/mi/ln)	12.0	16.5	25.5
LOS	В	В	C

#### Formulas and Reference Material

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

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HCM 2010, Equation 11-2

 $D_{MD} =$ 

0.0175\*v<sub>f</sub> N

HCM 2010, Equation 13-26

Basic Freeway Segments Max Service Flow Rates

	Capacity
FFS (mi/h)	(pc/h/ln)
75	2,400
70	2,400
65	2,350
60	2,300
55	2,250

Source: HCM 2010, Exhibit 11-17

Ramp Roadways Max Service Flow Rates

	Capacity
FFS (mi/h)	(pc/h/ln)
> 50	2,200
>40-50	2,100
>30-40	2,000
≥20-30	1,900
<20	1,800

Diverge LOS Thresholds

	Density			
LOS	(pc/mi/ln)			
Α	≤10			
В	>10-20			
С	>20-28			
D	>28-35			
Е	>35			
F	v/c > 1			

Source: HCM 2010, Exhibit 13-10

#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2038 Build-River Center Site PM Peak Navy Base ICTF Freeway/Direction Junction Segment ID I-26 WB WB On from US-17 SB 2030

Inputs

	Freeway Upstream of Ramp	Freeway Downstream of Ramp	Ramp
Number of Lanes, N	2	3	1
Free-Flow Speed, FFS (mph)	55	55	55
Volume, V (veh/h)	2,021	3,272	1,251
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	4%	4%	6%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Freeway Upstream Ramp	Freeway Downstream Ramp	Ramp
Heavy Vehicle Adjustment Factor, $f_{\text{HV}}$	0.98	0.98	0.97
Demand Flow Rate, $v_p$ (pc/h/ln)	1,145	1,236	1,432
Capacity Flow Rate, c (pc/h/ln)	2,250	2,250	2,200
v/c ratio	0.51	0.55	0.65
Density, D <sub>MD</sub> (pc/mi/ln)	20.0	21.6	25.1
LOS	В	C	С

#### Formulas and Reference Material

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

V. =

HCM 2010, Equation 11-2

 $D_{MD} =$ 

0.0175\*v<sub>f</sub> N

HCM 2010, Equation 13-26

Basic Freeway Segments Max Service Flow Rates

	Capacity
FFS (mi/h)	(pc/h/ln)
75	2,400
70	2,400
65	2,350
60	2,300
55	2,250

Source: HCM 2010, Exhibit 11-17

Ramp Roadways Max Service Flow Rates

	Capacity
FFS (mi/h)	(pc/h/ln)
> 50	2,200
>40-50	2,100
>30-40	2,000
≥20-30	1,900
<20	1,800

Diverge LOS Thresholds

	Density
LOS	(pc/mi/ln)
Α	≤10
В	>10-20
С	>20-28
D	>28-35
Е	>35
F	v/c > 1

Source: HCM 2010, Exhibit 13-10

		RAI	MPS AND	RAMP JUN	CTIONS W	ORKSH	EET				
General	Infori	mation			Site Infor	mation					
Analyst		AJR		Fr	eeway/Dir of Tr	avel	I-26 WB				
Agency or C	, ,	Atkin	S	Ju	ınction		2040 - W	B On from	Meeting		
ate Perforr		7/25/			ırisdiction						
nalysis Tin				Aı	nalysis Year	2038 Build - River Center Site					
	cription	Navy Base ICT	ſ <u>F</u>								
nputs			L							ĺ	
Jpstream A	dj Ramp		I '	ber of Lanes, N	3					Downstre	am Adj
			Ramp Numbe	r of Lanes, N	1					Ramp	
Yes	On		Acceleration L	ane Length, L <sub>A</sub>	600					□Yes	On
✓ No	Off		Deceleration L	ane Length L <sub>D</sub>						- No	
			Freeway Volu	me, V <sub>F</sub>	2473					☑ No	Off
up =	ft		Ramp Volume		396					L <sub>down</sub> =	ft
			1	-Flow Speed, S <sub>FF</sub>	55.0					l .	
′ <sub>u</sub> =	veh/h		1	ow Speed, S <sub>FR</sub>	45.0					V <sub>D</sub> =	veh/h
20 01 10 11	oion te	no/h Hn		111	43.0						
orivers	SIOII LC	y pc/n one		Conditions	1						
(pc/h	1)	v (Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>F</sub>	HV	f <sub>p</sub>	v = V/PHF	$= x f_{HV} x f_{p}$
reeway		2473	0.90	Level	6	0	0.97		1.00	2	2830
Ramp		396	0.90	Level	10	0	0.9		1.00		462
JpStream											
DownStrea	m										
			Merge Areas						verge Areas		
Stimat	ion of	v <sub>12</sub>				Estimation of v <sub>12</sub>					
		V <sub>12</sub> = V <sub>F</sub>	( P <sub>EM</sub> )					\/ - \/	± (\/ \/	\D	
<sub>EQ</sub> =		.= .	ation 13-6 or	13-7)		$V_{12} = V_R + (V_F - V_R)P_{FD}$					
FM =				ion (Exhibit 13-6)	١	$L_{EQ}$ = (Equation 13-12 or 13-13) $P_{FD}$ = using Equation (Exhibit 13-7)					
' <sub>12</sub> =		1682		IOTT (EXTILOR TO 0)	1	P <sub>FD</sub> =				n (Exhibit 1	3-7)
				on 13-14 or 13-		V <sub>12</sub> =			c/h		
or V <sub>av34</sub>		17)	pom (Equation	511 10-14-01 10-		V <sub>3</sub> or V <sub>av34</sub>			c/h (Equation 1	3-14 or 13-1	17)
s V <sub>3</sub> or V <sub>av</sub>	<sub>34</sub> > 2,700	0 pc/h? Ye:	s 🗹 No						Yes No		
		V <sub>12</sub> /2 Ye				Is V <sub>3</sub> or V <sub>av</sub>	<sub>34</sub> > 1.5 *		Yes No		
Yes,V <sub>12a</sub> =				3-16, 13-18, or		If Yes,V <sub>12a</sub> =	:		c/h (Equation	n 13-16, 1	3-18, or
		13-19)							-19)		
Capacit	y Che	cks				Capacit	y Che	cks			
		Actual	C	apacity	LOS F?			Actual		pacity	LOS F?
						$V_{F}$			Exhibit 13-8	3	
V <sub>F</sub>	,	3292	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>		Exhibit 13-8	3	
F	, I					V <sub>R</sub>			Exhibit 13-	-	
									10		
low Er	tering		fluence A			Flow En	tering	Diverg	ge Influen		
		Actual		Desirable	Violation?		Ac	tual	Max Desi	rable	Violation?
V <sub>R1</sub>		2144	Exhibit 13-8	4600:AII	No	V <sub>12</sub>			Exhibit 13-8		
			nination (i			-			erminatio	•	<i>F</i> )
D <sub>R</sub> =	5.475 +	0.00734 v <sub>R</sub> + 0	0.0078 V <sub>12</sub> - 0.0	00627 L <sub>A</sub>			$D_{R} = 4.2$	252 + 0.0	0086 V <sub>12</sub> - 0.	.009 L <sub>D</sub>	
D <sub>R</sub> = 18.2 (pc/mi/ln)					$D_R = (p$	c/mi/ln)	)				
	(Exhibit 1					1	Exhibit 1				
Speed Determination					Speed L			<u> </u>			
•											
•	.300 (Exib					,	xhibit 13	,			
		Exhibit 13-11)					ph (Exhib				
0	Exhibit 13-11)			$S_0 = m$	ph (Exhib	oit 13-12)					
5 = 5	1.6 mph (	Exhibit 13-13)				S = m	ph (Exhib	oit 13-13)			
	2 Universi	ity of Florida, All	Rights Reserve	h		HCS2010 <sup>TI</sup>	M Vorcion	26.41		Generated:	12/9/2014 2

Genera	l Inform		III O AND	RAMP JUN						
	iiiitorn				Site Infor		1.00.1475			
Analyst	omno:::	AJR Attrin	•		eeway/Dir of Tr		I-26 WB	from Master		
Agency or C		Atkins			nction		2040 - WB On	from Meeting		
Date Perfor		7/25/			risdiction		ver Center Site			
Analysis Tin		PM P lavy Base ICT		AI	nalysis Year		2036 Bulla - Ri	ver Center Site		
nputs	сприон г	lavy base io i	1							
			Freeway Num	her of Lanes N	3					
Jpstream A	dj Ramp		l '	Number of Lanes, N 3					Downstre	am Adj
Yes	On		Ramp Number		1				Ramp	
⊔ res			Acceleration L	ane Length, L <sub>A</sub>	600				Yes	On
☑ No	Off		Deceleration L	ane Length L <sub>D</sub>					☑ No	Off
			Freeway Volur	ne, V <sub>F</sub>	3272				I NO	
- <sub>up</sub> =	ft		Ramp Volume	, V <sub>D</sub>	785				L <sub>down</sub> =	ft
			1	Flow Speed, S <sub>FF</sub>	55.0					
/ <sub>u</sub> =	veh/h		1						$V_D =$	veh/h
		,, ,,		ow Speed, S <sub>FR</sub>	45.0					
conver	sion to		der Base (	Conditions	1	1	1	1	1	
(pc/l	h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	f <sub>p</sub>	v = V/PHI	x f <sub>HV</sub> x f
Freeway		3272	0.90	Level	4	0	0.980	1.00	-	3708
Ramp		785	0.90	Level	4	0	0.980	1.00		890
UpStream		100	0.00	LUVUI			0.300	1.00		000
DownStrea	m							+		
		ı	Merge Areas					Diverge Area	ıs	
Estimat	tion of					Estimati	ion of v <sub>12</sub>			
			/ D \							
		$V_{12} = V_{F}$					V <sub>12</sub>	$= V_R + (V_F - )^2$	$V_R)P_{FD}$	
EQ =			ation 13-6 or			L <sub>EQ</sub> = (Equation 13-12 or 13-13)				
P <sub>FM</sub> =		0.594	using Equat	ion (Exhibit 13-6)		P <sub>FD</sub> = using Equation (Exhibit 13-7)				
/ <sub>12</sub> =		2204	oc/h			V <sub>12</sub> =		pc/h	,	•
/ <sub>3</sub> or V <sub>av34</sub>		1504	oc/h (Equatio	on 13-14 or 13-		V <sub>3</sub> or V <sub>av34</sub>		•	on 13-14 or 13-4	17)
		17)				$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17) Is $V_3$ or $V_{av34} > 2,700$ pc/h? $\square$ Yes $\square$ No				
		pc/h? TYes								
Is $V_3$ or $V_{av}$	<sub>/34</sub> > 1.5 * \	$I_{12}/2 \  \  \  \  \  \  \  \  \  \  \  \  \ $				is v <sub>3</sub> or v <sub>av3</sub>	<sub>34</sub> > 1.5 ° V <sub>12</sub> /2	☐Yes ☐N		2 10
f Yes,V <sub>12a</sub> :	=	pc/h (	(Equation 13	-16, 13-18, or		If Yes,V <sub>12a</sub> =		pc/n (Equa 13-19)	tion 13-16, 1	3-18, Of
		13-19)				Composite	. Chaska	10 10)		
зарасп	ty Chec		1 0	.,	1.00.50	Capacity	y Checks		0 ''	1 100 5
		Actual	1	apacity	LOS F?	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	Actu		Capacity	LOS F
						V <sub>F</sub>		Exhibit 1	_	
V <sub>F</sub>	0	4598	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>	Exhibit 1	13-8	
	Ĭ					V <sub>R</sub>		Exhibit	13-	
								10		
Flow Er	<u>ntering</u>		fluence A		Y .	Flow En	<del></del>	erge Influ		
		Actual		Desirable	Violation?		Actual		Desirable	Violation
V <sub>R1</sub>		3094	Exhibit 13-8	4600:AII	No	V <sub>12</sub>	1	Exhibit 13-		
Level o	f Servic	ce Detern	nination (i	f not F)		Level of	Service L	Determinat	tion (if not	<i>F</i> )
D <sub>R</sub> =	= 5.475 + 0	.00734 v <sub>R</sub> + 0	0.0078 V <sub>12</sub> - 0.0	00627 L <sub>A</sub>		[	$D_R = 4.252 +$	0.0086 V <sub>12</sub> -	- 0.009 L <sub>D</sub>	
	5.4 (pc/mi/l		· <b>-</b>			$D_R = (p$	c/mi/ln)		_	
	Exhibit 1					1	Exhibit 13-2)			
OS = O	<u> </u>							tion		
		ınatıon				<del>- '</del>	<b>Determina</b> : xhibit 13-12)	lion		
	Determ	M <sub>S</sub> = 0.353 (Exibit 13-11)								
Speed L		t 13-11)				1				
<b>Speed L</b>	.353 (Exibi					1	ph (Exhibit 13-1	2)		
Speed L $M_S = 0$ $S_R = 5$	.353 (Exibi 0.4 mph (E	xhibit 13-11)				S <sub>R</sub> = m <sub>F</sub>	oh (Exhibit 13-1 oh (Exhibit 13-1			
<b>Speed L</b> $M_{\rm S} = 0$ $S_{\rm R} = 5$ $S_{\rm O} = 5$	.353 (Exibi 0.4 mph (E 1.4 mph (E					S <sub>R</sub> = mr S <sub>0</sub> = mr		2)		

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т		
General Information			Site Information			
Analyst	AJR		Highway/Direction of Trave			
Agency or Company	Atkins		From/To	2050 - N Pleasan	Meeting to Mt	
Date Performed	7/25/2014		Jurisdiction	i icasan	n.	
Analysis Time Period	AM Peak		Analysis Year	2038 Βι Site	uild - River Center	
Project Description Navy	Base ICTF					
✓ Oper.(LOS)			es.(N)	Plar	nning Data	
Flow Inputs						
Volume, V AADT	2869	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 5		
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0		
Peak-Hr Direction Prop, D			General Terrain:	Level		
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi		
Calculate Flow Adjus	tments		·			
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2		
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.976		
Speed Inputs			Calc Speed Adj and FFS			
Lane Width		ft				
Rt-Side Lat. Clearance		ft	f <sub>LW</sub>		mph	
Number of Lanes, N	3		f <sub>LC</sub>		mph	
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph	
FFS (measured)	55.0	mph	FFS	55.0	mph	
Base free-flow Speed, BFFS		mph		33.0	Πρπ	
LOS and Performanc	e Measures	<del></del>	Design (N)			
			Design (N)			
Operational (LOS)			Design LOS			
$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub> 1089	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>		
x f <sub>p</sub> )		•	x f <sub>p</sub> )	110	pc/h/ln	
S	55.0	mph	S		mph	
$D = v_p / S$	19.8	pc/mi/ln	$D = v_p / S$		pc/mi/ln	
LOS	С		Required Number of Lanes	s, N	·	
Glossary			Factor Location			
N - Number of lanes	S - Spee	ed	E Evhibite 11 10 11 12		f Evhihit 11.8	
V - Hourly volume	D - Dens		$E_{R}$ - Exhibits 11-10, 11-12 $E_{T}$ - Exhibits 11-10, 11-11,	11_13	f <sub>LW</sub> - Exhibit 11-8	
v <sub>p</sub> - Flow rate		e-flow speed	1 '	11-13	f <sub>LC</sub> - Exhibit 11-9	
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18	11 2	TRD - Page 11-1	
speed	haur valeess		LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-4,		
DDHV - Directional design	riour volume		1			

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т		
General Information			Site Information			
Analyst	AJR		Highway/Direction of Trave			
Agency or Company	Atkins		From/To	2050 - N Pleasan	Meeting to Mt	
Date Performed	7/25/2014		Jurisdiction	i icasan	ii.	
Analysis Time Period	PM Peak		Analysis Year	2038 Βι Site	uild - River Center	
Project Description Navy	Base ICTF					
✓ Oper.(LOS)			Des.(N)	□Plar	nning Data	
Flow Inputs						
Volume, V	4057	veh/h	Peak-Hour Factor, PHF	0.90		
AADT		veh/day	%Trucks and Buses, $P_T$	5		
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0		
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length	Level mi		
DDHV - AADTXKXD		VEII/II	Grade % Length Up/Down %	1111		
Calculate Flow Adjus	tments					
$f_p$	1.00		E <sub>R</sub>	1.2		
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] <i>0.976</i>		
Speed Inputs			Calc Speed Adj and FFS			
Lane Width		ft				
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph	
Number of Lanes, N	3		f <sub>LC</sub>		mph	
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph	
FFS (measured)	55.0	mph	FFS	55.0	mph	
Base free-flow Speed, BFFS		mph		33.0	тірп	
LOS and Performanc	e Measures		Design (N)			
	o mododi ot		Design (N)			
Operational (LOS)			Design LOS			
$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV 1540</sub>	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f		
x f <sub>p</sub> )	1540	рсліліі	'	''A 'HV	pc/h/ln	
S	55.0	mph	x f <sub>p</sub> ) S		mnh	
D = v <sub>p</sub> / S	28.0	pc/mi/ln			mph	
LOS	D		$D = v_p / S$ Required Number of Lanes	s N	pc/mi/ln	
Glossary			Factor Location			
N - Number of lanes	S - Spee	ed				
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12	44.45	f <sub>LW</sub> - Exhibit 11-8	
v <sub>n</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9	
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18		TRD - Page 11-1	
speed	<b>5</b>		LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,		
DDHV - Directional design	hour volume		11-3			
				-		

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			MPS AND	RAMP JUN			EET			
General	Infor	mation			Site Infor	mation				
Analyst		AJR		Fi	reeway/Dir of Tr	avel	I-26 WB			
Agency or C	, ,	Atkin			unction		2060 - WB	On from Mt Pleasa	nt	
Date Perforr		7/25/			urisdiction					
Analysis Tim				A	nalysis Year		2038 Build	- River Center Site		
	cription	Navy Base ICT	l <del>l</del>							
nputs			le v						1	
Jpstream A	dj Ramp		I '	ber of Lanes, N	3					ream Adj
Yes	On		Ramp Numbe		1				Ramp	
⊥ res	□ On		Acceleration L	ane Length, L <sub>A</sub>	275				□Yes	On
✓ No	Off		Deceleration L	ane Length L <sub>D</sub>					✓ No	Off
			Freeway Volu	me, V <sub>F</sub>	2869				I INO	
up =	ft		Ramp Volume	, V <sub>D</sub>	322				L <sub>down</sub> =	ft
			1	-Flow Speed, S <sub>FF</sub>	55.0				.,	
/ <sub>u</sub> =	veh/h		1	ow Speed, S <sub>FR</sub>	45.0				$V_D =$	veh/h
CONVOR	sion to	nc/h Hn/		Conditions	70.0					
		<i>γ ρ</i> υ/π υπο ∀								
(pc/h	1)	(Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	f <sub>p</sub>	v = V/Pł	$HF \times f_HV \times f_p$
Freeway		2869	0.90	Level	5	0	0.976	1.00		3267
Ramp		322	0.90	Level	10	0	0.952	1.00		376
JpStream										
DownStrea	m									
			Merge Areas					Diverge Area	ıs	
Estimat	ion of	V <sub>12</sub>				Estimat	ion of v	12		
		V <sub>12</sub> = V <sub>F</sub>	( P <sub>EM</sub> )					/ <sub>12</sub> = V <sub>R</sub> + (V <sub>F</sub> -	\/ \D	
. <sub></sub> =		.= .	ation 13-6 or	13-7)			,			40)
$L_{EQ}$ = (Equation 13-6 or 13-7) $P_{FM}$ = 0.585 using Equation (Exhibit 13-6)				)	L <sub>EQ</sub> =		(Equation			
/ <sub>12</sub> =		1912		IOTT (EXTILOR TO 0)	/	P <sub>FD</sub> =		using Equa	ation (Exhibit	13-7)
				on 13-14 or 13-		V <sub>12</sub> =		pc/h		
$V_3$ or $V_{av34}$		17)	pom (Equation	DII 13-14 01 13-		V <sub>3</sub> or V <sub>av34</sub>			on 13-14 or 13	3-17)
s V <sub>3</sub> or V <sub>av</sub>	<sub>34</sub> > 2,700	0 pc/h? Ye:	s 🗹 No					oc/h? 🗌 Yes 🔲 t		
		V <sub>12</sub> /2 Ye				Is V <sub>3</sub> or V <sub>av</sub>	<sub>34</sub> > 1.5 * V	<sub>12</sub> /2 □Yes □1		
f Yes,V <sub>12a</sub> =				8-16, 13-18, or		If Yes,V <sub>12a</sub> =	=	pc/h (Equa	tion 13-16,	13-18, or
		13-19)						13-19)		
Capacit	y Che	cks				Capacit	y Chec	ks		
		Actual	C	apacity	LOS F?				Capacity	LOS F?
						$V_{F}$		Exhibit	13-8	
V <sub>FC</sub>	,	3643	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>	Exhibit	13-8	
FC	ا ا					V <sub>R</sub>		Exhibit	13-	
								10		
-low En	tering		fluence A			Flow Er	tering I	Diverge Influ		
		Actual		Desirable	Violation?		Actu		Desirable	Violation?
V <sub>R1</sub>		2288	Exhibit 13-8	4600:All	No	V <sub>12</sub>		Exhibit 13-		
.evel of	Servi	ce Detern	nination (i	f not F)				e Determinat	•	ot F)
D <sub>R</sub> =	5.475 +	0.00734 v <sub>R</sub> + 0	0.0078 V <sub>12</sub> - 0.0	00627 L <sub>A</sub>			$D_{R} = 4.25$	52 + 0.0086 V <sub>12</sub>	- 0.009 L <sub>D</sub>	
) <sub>R</sub> = 2 <sup>2</sup>	1.4 (pc/mi	i/ln)				$D_R = (p$	oc/mi/ln)			
	(Exhibit					1	Exhibit 13	-2)		
Speed Determination					Speed L					
					<del>  '</del>					
•							Exhibit 13-1	•		
• • • • • • • • • • • • • • • • • • • •						1 ''	ph (Exhibit			
0	<sub>2</sub> = 51.9 mph (Exhibit 13-11)					$S_0 = m$	ph (Exhibit	13-12)		
S = 5'	1.1 mph (	Exhibit 13-13)				S = m	ph (Exhibit	13-13)		
			Rights Reserve		_		M Version 6			d: 12/9/2014 2

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			MPS AND	RAMP JUN			ET			
General	l Inform	nation			Site Infor	mation				
Analyst		AJR		F	reeway/Dir of Tr	avel l	-26 WB			
Agency or C	Company	Atkin	S	Jı	unction	2	2060 - WB On f	rom Mt Pleasant		
Date Perform		7/25/	2014	Jı	urisdiction					
Analysis Tin		PM P		A	nalysis Year	2	2038 Build - Riv	ver Center Site		
	cription	Navy Base ICT	F							
nputs									1	
Jpstream A	dj Ramp		Freeway Numb	er of Lanes, N	3				Downstre	am Adj
			Ramp Number	of Lanes, N	1				Ramp	-
☐ Yes	On		Acceleration La	ne Length, L <sub>A</sub>	275				□Yes	On
☑ No	Off		Deceleration La	ane Length L <sub>D</sub>						
INO			Freeway Volum	- 5	4057				☑ No	Off
- <sub>up</sub> =	ft		Ramp Volume,		767				L <sub>down</sub> =	ft
ир			1	Flow Speed, S <sub>FF</sub>						
/ <sub>u</sub> =	veh/h		1						$V_D =$	veh/h
			Ramp Free-Flo	111	45.0					
Convers	sion to		der Base C	conditions	T	Ī	1		1	
(pc/l	h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	f <sub>p</sub>	v = V/PH	F x f <sub>HV</sub> x f <sub>p</sub>
Freeway		4057	0.90	Level	5	0	0.976	1.00		4620
Ramp		767	0.90	Level	4	0	0.980	1.00		869
UpStream		101	0.50	LCVCI	<del>                                     </del>	_ <u> </u>	0.500	1.00		000
DownStream	m							<del>                                     </del>		
	<u>!</u>		Merge Areas		!			Diverge Areas		
Stimat	ion of					Estimation	on of v <sub>12</sub>			
		V <sub>12</sub> = V <sub>F</sub>	(P)							
_				40.7\			V <sub>12</sub> :	$= V_R + (V_F - V_F)$	R)P <sub>FD</sub>	
EQ =			ation 13-6 or			L <sub>EQ</sub> =		(Equation 13-	-12 or 13-	13)
P <sub>FM</sub> =				on (Exhibit 13-6	)	P <sub>FD</sub> =		using Equation	on (Exhibit 1	3-7)
/ <sub>12</sub> =		2704				V <sub>12</sub> =		pc/h		
/ <sub>3</sub> or V <sub>av34</sub>			pc/h (Equatio	n 13-14 or 13	-	V <sub>3</sub> or V <sub>av34</sub>		pc/h (Equation	13-14 or 13-	17)
	> 2 700	17) ) pc/h?					, > 2,700 pc/h?	Yes No		,
								☐Yes ☐No		
	-	V <sub>12</sub> /2 ☐ Yes		10 10 10		" ""		pc/h (Equation		13-18. or
f Yes,V <sub>12a</sub> =	=	13-19)		-16, 13-18, or		If Yes,V <sub>12a</sub> =		13-19)		
Capacit	v Ched					Capacity	Checks			
	, J	Actual	Ca	pacity	LOS F?		Actua	al Ca	pacity	LOS F?
		7101001	Ť	.puo.ty		V <sub>F</sub>	7.000	Exhibit 13-		
							. \/	Exhibit 13-	_	
V <sub>F</sub>	0	5489	Exhibit 13-8		No	$V_{FO} = V_{F}$	VR	Exhibit 13		
						$V_R$		10	)-	
low Fr	nterina	Merae In	fluence A	rea		Flow Ent	terina Div	erge Influer	nce Area	,
.0.,		Actual		esirable	Violation?		Actual	Max Des		Violation?
V <sub>R1</sub>	,	3573	Exhibit 13-8	4600:All	No	V <sub>12</sub>	1	Exhibit 13-8		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
	1		nination (ii		1	+	Service D	eterminatio	n (if no	<i>f F</i> )
			0.0078 V <sub>12</sub> - 0.0	•		1		0.0086 V <sub>12</sub> - 0	-	/
		.,	7.0070 V <sub>12</sub> - 0.0	UUZI LA		1		0.0000 v <sub>12</sub> - 0	L <sub>D</sub>	
$O_R = 3$	1.2 (pc/mi/	•				I	c/mi/ln)			
	(Exhibit 1					LOS = (Exhibit 13-2)				
	Dotorm	ination				Speed D	eterminat	ion		
	Jeterni					h - /Fv	(hibit 13-12)			
Speed L		it 13-11)				P <sub>s</sub> - (⊏x	(11101( 13-12)			
<b>Speed L</b> M <sub>S</sub> = 0.	.435 (Exib					1 "		2)		
Speed L $M_S = 0.5$ $S_R = 49$	.435 (Exib 9.3 mph (E	Exhibit 13-11)				S <sub>R</sub> = mp	h (Exhibit 13-1			
Speed L $M_{\rm S} = 0.$ $S_{\rm R} = 49$ $S_{\rm O} = 49$	.435 (Exib 9.3 mph (E 9.9 mph (E					$S_R = mp$ $S_0 = mp$		2)		

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			MPS AND	RAMP JUN			EET			
General	Infor	mation			Site Infor	mation				
Analyst		AJR			eeway/Dir of Tr	avel	I-26 WB			
Agency or C	, ,	Atkin			ınction		2070 - WB	On from Heriot		
ate Perforr		7/25/			ırisdiction					
nalysis Tin				Ai	nalysis Year		2038 Build	- River Center Site		
	cription	Navy Base IC1	<u> </u>							
nputs			Fra access Nicos	hanaflanaa N					1	
Ipstream A	dj Ramp		1 1	ber of Lanes, N	3					eam Adj
Yes	On		Ramp Numbe		1				Ramp	
165			1	ane Length, L <sub>A</sub>	1165				☐Yes	On
✓ No	☐ Off		Deceleration L	ane Length L <sub>D</sub>					✓ No	Off
_			Freeway Volu	me, V <sub>F</sub>	3191				I INO	
<sub>.p</sub> =	ft		Ramp Volume	, V <sub>R</sub>	291				L <sub>down</sub> =	ft
			1	-Flow Speed, S <sub>FF</sub>	55.0				., _	
' <sub>u</sub> =	veh/h		1	ow Speed, S <sub>FR</sub>	45.0				$V_D =$	veh/h
CONVOY	sion to	nc/h Hn/		Conditions	10.0					
		y pc/ii oiid ∀								
(pc/h	n)	(Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	f <sub>p</sub>	v = V/PI	$HF \times f_{HV} \times f_{p}$
reeway		3191	0.90	Level	6	0	0.971	1.00		3652
Ramp		291	0.90	Level	21	0	0.905	1.00		357
JpStream										
OownStream	m									
			Merge Areas					Diverge Area	S	
stimat	ion of	V <sub>12</sub>				Estimat	ion of v	12		
		V <sub>12</sub> = V <sub>F</sub>	(P <sub>EM</sub> )				\	/ <sub>12</sub> = V <sub>R</sub> + (V <sub>F</sub> -	V \P	
EQ =			ation 13-6 or	13-7)		_	`			12)
P <sub>FM</sub> = 0.610 using Equation (Exhibit 13-6)				1	L <sub>EQ</sub> =		(Equation 1			
' <sub>12</sub> =		2228		ion (Exmon 10 0)		P <sub>FD</sub> =		using Equa	ition (Exhibit	13-7)
				on 13-14 or 13-		V <sub>12</sub> =		pc/h		
or V <sub>av34</sub>		17)	pom (Equation	DIT 10-14-01-10-		V <sub>3</sub> or V <sub>av34</sub>		pc/h (Equation		-17)
s V <sub>3</sub> or V <sub>av</sub>	<sub>34</sub> > 2,700	0 pc/h? Ye:	s 🗹 No					oc/h? □Yes □N		
		V <sub>12</sub> /2				Is V <sub>3</sub> or V <sub>av3</sub>	<sub>34</sub> > 1.5 * V.	<sub>12</sub> /2 □Yes □N		
Yes,V <sub>12a</sub> =				3-16, 13-18, or		If Yes,V <sub>12a</sub> =	:	pc/h (Equa	tion 13-16,	13-18, or
		13-19)						13-19)		
Capacit	y Che	<u>cks</u>				Capacit	y Check	rs		
		Actual	C	apacity	LOS F?				Capacity	LOS F?
						V <sub>F</sub>		Exhibit '	13-8	
V <sub>F</sub>	,	4009	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>	Exhibit '	13-8	
F	, I					V <sub>R</sub>		Exhibit	13-	
								10		
low Er	tering	Merge In				Flow En	tering L	Diverge Influ		
		Actual		Desirable	Violation?		Actu	_	esirable	Violation?
V <sub>R1</sub>		2585	Exhibit 13-8	4600:AII	No	V <sub>12</sub>		Exhibit 13-		1
		ice Detern		<u> </u>				e Determinat	•	t F)
D <sub>R</sub> =	5.475 +	0.00734 v <sub>R</sub> + 0	0.0078 V <sub>12</sub> - 0.0	00627 L <sub>A</sub>			$D_{R} = 4.25$	2 + 0.0086 V <sub>12</sub> -	- 0.009 L <sub>D</sub>	
<sub>R</sub> = 18	8.2 (pc/mi	i/ln)				$D_R = (p$	c/mi/ln)			
	(Exhibit 1					1	Exhibit 13	-2)		
Speed Determination					Speed D					
					<del></del>					
•						,	xhibit 13-12	•		
						I ''	ph (Exhibit			
51.7 mph (Exhibit 13-11)						$S_0 = m$	ph (Exhibit	13-12)		
S = 5°	1.6 mph (	Exhibit 13-13)				S = m	ph (Exhibit	13-13)		
		9 . C.EL	Rights Reserve				M Version 6	44	Canarata	l: 12/9/2014 2

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			MPS AND	RAMP JUN			EET			
General	Infor	mation			Site Infor	mation				
Analyst		AJR		Fi	reeway/Dir of Tr	avel	I-26 WB			
Agency or C	, ,	Atkin	S		unction		2070 - WB (	On from Heriot		
Date Perforr		7/25/			urisdiction					
Analysis Tin				A	nalysis Year		2038 Build -	River Center Site		
	cription	Navy Base ICT	<u>                                     </u>							
nputs			le v							
Jpstream A	dj Ramp		1 ′	ber of Lanes, N	3				Downstr	eam Adj
Yes	On		Ramp Numbe		1				Ramp	
res			Acceleration L	ane Length, L <sub>A</sub>	1165				☐Yes	On
✓ No	Off		Deceleration L	ane Length L <sub>D</sub>					✓ No	Off
			Freeway Volu	me, V <sub>F</sub>	4824				INO	
up =	ft		Ramp Volume	, V <sub>R</sub>	487				L <sub>down</sub> =	ft
			1	Flow Speed, S <sub>FF</sub>	55.0				.,	
/ <sub>u</sub> =	veh/h		1	ow Speed, S <sub>FR</sub>	45.0				V <sub>D</sub> =	veh/h
Convor	sion to	nc/h Hn/		Conditions	40.0					
		<del>Σ ρεπ οπ</del> ∀					1 .	1 .		
(pc/h	1)	(Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	f <sub>p</sub>	v = V/PF	IF x f <sub>HV</sub> x f <sub>p</sub>
Freeway		4824	0.90	Level	5	0	0.976	1.00		5494
Ramp		487	0.90	Level	11	0	0.948	1.00		571
JpStream										
DownStrea	m									
			Merge Areas					Diverge Areas	3	
Stimat	ion of	v <sub>12</sub>				Estimat	ion of v <sub>1</sub>	12		
		V <sub>12</sub> = V <sub>F</sub>	(P <sub>FM</sub> )				V	<sub>12</sub> = V <sub>R</sub> + (V <sub>F</sub> - V	/_)P	
<sub>EQ</sub> =		(Equa	ation 13-6 or	13-7)			•	(Equation 1		12)
) FM =		0.610	using Eguat	ion (Exhibit 13-6)	)	L <sub>EQ</sub> =				
' <sub>12</sub> =		3352		(	,	P <sub>FD</sub> =		using Equat	IIOII (EXIIIDIL	13-1)
				on 13-14 or 13-		V <sub>12</sub> =		pc/h		
$^{\prime}_{3}$ or $V_{av34}$		17)	po (= qua			V <sub>3</sub> or V <sub>av34</sub>		pc/h (Equation		-17)
s V <sub>3</sub> or V <sub>av</sub>	<sub>34</sub> > 2,700	0 pc/h?  Ye	s 🗹 No					c/h? ☐ Yes ☐ N		
s V <sub>3</sub> or V <sub>av</sub>	<sub>34</sub> > 1.5 *	V <sub>12</sub> /2	s 🗹 No			Is V <sub>3</sub> or V <sub>av3</sub>	<sub>34</sub> > 1.5 * V <sub>12</sub>	½ □Yes □N		
Yes,V <sub>12a</sub> =		pc/h	(Equation 13	3-16, 13-18, or		If Yes,V <sub>12a</sub> =		pc/h (Equat 13-19)	ion 13-16,	13-18, or
		13-19)								
Capacit	y Che				_	Capacit		1		
		Actual	C	apacity	LOS F?		A		Capacity	LOS F?
						V <sub>F</sub>		Exhibit 1	3-8	
V <sub>F</sub>	,	6065	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>	Exhibit 1	3-8	
1						V <sub>R</sub>		Exhibit 1	3-	
								10		
low En	tering		fluence A		1	Flow En		iverge Influe		
		Actual		Desirable	Violation?		Actua		esirable	Violation?
V <sub>R1</sub>		3923	Exhibit 13-8	4600:All	No	V <sub>12</sub>		Exhibit 13-8		
			nination (i			-		Determinati	•	t F)
D <sub>R</sub> =	5.475 +	0.00734 v <sub>R</sub> + 0	0.0078 V <sub>12</sub> - 0.0	00627 L <sub>A</sub>		'	$D_{R} = 4.252$	2 + 0.0086 V <sub>12</sub> -	0.009 L <sub>D</sub>	
) <sub>R</sub> = 28	3.5 (pc/mi	i/ln)				$D_R = (p$	c/mi/ln)			
	(Exhibit	13-2)				1	xhibit 13-2	2)		
Speed Determination					Speed D					
•						<del>  '                                   </del>	xhibit 13-12)			
•							,			
••						.,	ph (Exhibit 1			
0= 49.1 mph (Exhibit 13-11)						ľ	ph (Exhibit 1			
5 = 49	9.4 mph (	Exhibit 13-13)				S = m	ph (Exhibit 1	3-13)		
vriaht © 201	2 Universi	itv of Florida. All	Rights Reserve			HCS2010 <sup>TN</sup>	M Version 6.4	41	Generated	: 12/9/2014 2:

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed	AJR Atkins 7/25/2014		Highway/Direction of Trave From/To Jurisdiction	2080 - 1	Heriot to PAR
Analysis Time Period	AM Peak		Analysis Year	2038 Bi Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Pla	nning Data
Flow Inputs					
Volume, V AADT	3482	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 6	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$		
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	3		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performanc	e Measures	3	Design (N)		
Operational (LOS) v <sub>p</sub> = (V or DDHV) / (PHF x	N x f		<u>Design (N)</u> Design LOS		
x f <sub>p</sub> )		pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x x f_p)$	N x f <sub>HV</sub>	pc/h/ln
S - v / S	60.0	mph	s		mph
D = v <sub>p</sub> / S	22.1	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	С		Required Number of Lane	s, N	
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed DDHV - Directional design	BFFS - Ba		E <sub>R</sub> - Exhibits 11-10, 11-12 E <sub>T</sub> - Exhibits 11-10, 11-11 f <sub>p</sub> - Page 11-18 LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	, 11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed	AJR Atkins 7/25/2014		Highway/Direction of Trave From/To Jurisdiction	2080 - H	Heriot to PAR
Analysis Time Period	PM Peak		Analysis Year	2038 Bu Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			es.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	5311	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 5	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub> E <sub>T</sub>	1.00 1.5		$E_R$ $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1.2	
Speed Inputs	7.0		Calc Speed Adj and		
Lane Width		ft	Caro Opoca / taj arra		
Rt-Side Lat. Clearance		ft	f <sub>LW</sub>		mph
Number of Lanes, N	3		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph		00.0	πρπ
LOS and Performanc	e Measures	<b>3</b>	Design (N)		
Operational (LOS) v <sub>p</sub> = (V or DDHV) / (PHF x I	N x f <sub>HV 2016</sub>	n o /lo /l n	Design (N) Design LOS	N v f	
x f <sub>p</sub> ) S	56.9	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x x f_p)$	IN X I <sub>HV</sub>	pc/h/ln
D = v <sub>p</sub> / S	35.5	mph pc/mi/ln	S		mph
LOS	E	релипп	$D = v_p / S$ Required Number of Lanes	s N	pc/mi/ln
Glossani			Factor Location	5, IN	
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed	BFFS - Ba		$E_R$ - Exhibits 11-10, 11-12 $E_T$ - Exhibits 11-10, 11-11, $f_p$ - Page 11-18 LOS, S, FFS, $v_p$ - Exhibits	11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1
DDHV - Directional design Copyright © 2012 University of Floric		rved	HCS 2010 <sup>TM</sup> Version 6.41	Gene	rated: 12/9/2014 2:07 P

		RAMP	S AND RAM	IP JUNCTI	ONS WO	RKS	HEET			
General Infor	mation			Site Infor						
Analyst Agency or Company	AJR Atkin		J	reeway/Dir of Tr unction	ravel	I-26 WI 2090-V	3 VB Off to P	AR		
Date Performed  Analysis Time Perior		eak		urisdiction nalysis Year		2038 B	uild - River	Center Site		
Project Description	Navy Base IC1	F								
Inputs		<u> </u>								
Upstream Adj F	_	Freeway Num Ramp Numbe	ber of Lanes, N or of Lanes, N	3 1					Downstrea Ramp	m Adj
	Deceleration Lane Length, L			340					□Yes	On
	_l Off	Freeway Volume, V <sub>F</sub>							<b>☑</b> No	Off
ир	t	Ramp Volume, V <sub>R</sub> Freeway Free-Flow Speed, S							L <sub>down</sub> =	ft
u u	Ramp Free-Flow Speed, S <sub>FR</sub> 4			60.0 45.0					V <sub>D</sub> =	veh/h
Conversion t	·	der Base	Conditions							
(pc/h)	(Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	<u>'</u>	v = V/PHF	· ·
Freeway	3482	0.90	Level	6	0	_	971	1.00	398	
Ramp UpStream	632	0.90	Level	41	0	0.	830	1.00	84	6
DownStream	<u> </u>	<u> </u>			<del>                                     </del>					
Estimation of		Merge Areas			Fatimat	iono		iverge Areas		
Estimation of v <sub>12</sub>					Estimat	1011 0				
$V_{12} = V_F (P_{FM})$ $L_{EQ} =$ (Equation 13-6 or 13-7)					L <sub>EQ</sub> =			V <sub>R</sub> + (V <sub>F</sub> - V <sub>R</sub> Equation 13-1		
L-"					P <sub>FD</sub> =		-	621 using Equ		
P <sub>FM</sub> =	pc/h	Equation (i	EXHIBIT 10 0)		V <sub>12</sub> =			97 pc/h	iation (Exilia	JIC 10-1)
V <sub>12</sub> =		Caatia.a 40	44 - 40 47)					•	-t' 40 44	40 47)
$V_3$ or $V_{av34}$ Is $V_3$ or $V_{av34} > 2,70$			-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>	> 2.7		88 pc/h (Equa ∃Yes ☑ No	ation 13-14	or 13-17)
0 0,0,										
Is $V_3$ or $V_{av34} > 1.5$ If Yes, $V_{12a} =$		Equation 13	-16, 13-18, or		If Yes,V <sub>12a</sub> =	-		Yes V No c/h (Equation	13-16, 13-	18, or 13-
Capacity Che					Capacit	v Ch		-,		
	Actual		Capacity	LOS F?		,	Actual	Car	pacity	LOS F?
	7 101001		- apacity		V <sub>F</sub>		3985	Exhibit 13-8	1	No
V <sub>FO</sub>		Exhibit 13-8			V <sub>FO</sub> = V <sub>F</sub>	- V <sub>R</sub>	3139	Exhibit 13-8	-	No
					$V_R$		846	Exhibit 13-10	2100	No
Flow Entering	g Merge In	fluence A	\rea		Flow En	terin	g Diver	ge Influenc	ce Area	
	Actual		Desirable	Violation?		_	Actual	Max Desirab		Violation?
V <sub>R12</sub>		Exhibit 13-8			V <sub>12</sub>	2	2797	Exhibit 13-8	4400:All	No
Level of Serv	ice Detern	nination (	if not F)		Level of	Ser	vice De	<u>terminatior</u>	า (if not l	=)
$D_R = 5.475 + 0$	.00734 v <sub>R</sub> +	0.0078 V <sub>12</sub> -	- 0.00627 L <sub>A</sub>			D <sub>R</sub> = 4	1.252 + 0.	0086 V <sub>12</sub> - 0.0	009 L <sub>D</sub>	
D <sub>R</sub> = (pc/mi/lr	*				1 ''		/mi/ln)			
LOS = (Exhibit 13-2)					+		oit 13-2)			
Speed Deteri M <sub>S</sub> = (Exibit 1					<b>Speed D</b> $D_s = 0.0$		<i>minatio</i> xhibit 13-			
$S_R = \text{mph (Exhibit 13-11)}$					$S_R = 53.3 \text{ mph (Exhibit } 13-12)$					
S <sub>0</sub> = mph (Ext	nibit 13-11) nibit 13-13)				$S_0 = 65$		(Exhibit	*		
		VII Diabte D	wod		HCS2010 <sup>TM</sup>		(Exhibit		nerated: 12/9/	2014 0:10 5
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	RAME	PS AND RAM	P JUNCTI	ONS WO	RKS	HEET			
General Information			Site Infor						
,	AJR	Fr	eeway/Dir of Tr	avel	I-26 WI	3			
Agency or Company	Atkins	Ju	ınction		2090-V	/B Off to P	AR		
	7/25/2014		ırisdiction						
,	PM Peak	Ar	nalysis Year		2038 B	uild - Rive	Center Site		
Project Description Navy Bas	e ICTF								
Inputs	In a sure of New	ubanafi anaa Ni						1	
Upstream Adj Ramp	1 '	nber of Lanes, N er of Lanes, N	3 1					Downstrea Ramp	ım Adj
□Yes □On	·	Lane Length, L	ļ					l_	
☑ No ☐ Off	Deceleration	340					Yes	On	
✓ No ☐ Off	Freeway Vol		5311					☑ No	Off
L <sub>up</sub> = ft	Ramp Volum	e, V <sub>R</sub>	319					L <sub>down</sub> =	ft
	Freeway Fre	e-Flow Speed, S <sub>FF</sub>	60.0					\/ -	voh/h
$V_u = veh/h$	Ramp Free-F	Flow Speed, S <sub>ER</sub>	45.0					V <sub>D</sub> =	veh/h
Conversion to pc/h	Under Base	Conditions							
(pc/h) V (Veh/h	nr) PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	f <sub>p</sub>	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>
Freeway 5311	0.90	Level	5	0	0.	976	1.00	60-	49
Ramp 319	0.90	Level	36	0	0.	847	1.00	41	18
UpStream									
DownStream	Maria						N A		
Estimation of v <sub>12</sub>	Merge Areas			Estimat	ion o	f v	Diverge Areas		
				LStimat	.1011 0		., ., .,		
	= V <sub>F</sub> ( P <sub>FM</sub> ) Equation 13-6 o	40 <b>-</b> )					V <sub>R</sub> + (V <sub>F</sub> - V <sub>I</sub>		
		L <sub>EQ</sub> =			Equation 13-1				
1 141	sing Equation	(Exhibit 13-6)		P <sub>FD</sub> =		0.	590 using Eq	uation (Exhil	bit 13-7)
	c/h			V <sub>12</sub> =			738 pc/h		
	c/h (Equation 1	3-14 or 13-17)		$V_3$ or $V_{av34}$		23	311 pc/h (Equ	ation 13-14	or 13-17
Is $V_3$ or $V_{av34} > 2,700$ pc/h?				Is V <sub>3</sub> or V <sub>av</sub>	<sub>/34</sub> > 2,7	00 pc/h? [	☐ Yes 🗹 No		
Is $V_3$ or $V_{av34} > 1.5 * V_{12}/2$	]Yes ☐ No			Is V <sub>3</sub> or V <sub>av</sub>	<sub>/34</sub> > 1.5	* V <sub>12</sub> /2	☐ Yes ☑ No		
	c/h (Equation 1: 3-19)	3-16, 13-18, or		If Yes,V <sub>12a</sub> =	=		oc/h (Equation 9)	13-16, 13-	18, or 13
Capacity Checks	-19)			Capacit			3)		
Actua	al	Capacity	LOS F?			Actual	Ca	pacity	LOS F
				V <sub>F</sub>		6049	Exhibit 13-8	6900	No
V <sub>FO</sub>	Exhibit 13-8			V <sub>FO</sub> = V <sub>F</sub>	- V <sub>R</sub>	5631	Exhibit 13-8	8 6900	No
				V <sub>R</sub>	-	418	Exhibit 13-1	0 2100	No
Flow Entering Merg	e Influence /	1 A <i>r</i> ea				a Dive	rge Influen		
Actua		Desirable	Violation?	1000		Actual	Max Desiral		Violation
V <sub>R12</sub>	Exhibit 13-8			V <sub>12</sub>	3	738	Exhibit 13-8	4400:All	No
Level of Service Det	termination	(if not F)			f Serv	rice De	terminatio	n (if not l	F)
							.0086 V <sub>12</sub> - 0.		,
$D_R = 5.475 + 0.00734 \text{ V}$		_		1			14	D	
D <sub>R</sub> = 5.475 + 0.00734 v	ix - 12			D <sub>R</sub> = 33.3 (pc/mi/ln) LOS = D (Exhibit 13-2)					
$D_R = 5.475 + 0.00734 \text{ v}$ $D_R = (\text{pc/mi/ln})$	ix - 12			l .,		,			
$D_R = 5.475 + 0.00734 \text{ v}$ $D_R = (\text{pc/mi/ln})$ + 0.000 = (Exhibit 13-2)				LOS = D	(Exhil	oit 13-2)	on		
$D_R = 5.475 + 0.00734 \text{ v}$ $D_R = (\text{pc/mi/ln})$ $D_R = (\text{Exhibit 13-2})$ Speed Determination				LOS = D	(Exhil	oit 13-2) <b>minatic</b>			
$D_R = 5.475 + 0.00734 \text{ v}$ $D_R = (\text{pc/mi/ln})$ .0S = (Exhibit 13-2) <b>Speed Determinatio</b> $M_S = (\text{Exibit 13-11})$	n			LOS = D <b>Speed L</b> $D_s = 0$	(Exhib Deter	oit 13-2) <b>minatio</b> xhibit 13	-12)		
$D_R = 5.475 + 0.00734 \text{ v}$ $D_R = (\text{pc/mi/In})$ $D_R = (\text{Exhibit } 13-2)$ <b>Speed Determinatio</b> $D_R = (\text{Exibit } 13-11)$ $D_R = (\text{Exhibit } 13-11)$ $D_R = (\text{Exhibit } 13-11)$ $D_R = (\text{Exhibit } 13-11)$	<b>n</b>			LOS = D Speed L D <sub>s</sub> = 0. S <sub>R</sub> = 54	(Exhib Deter .336 (E 4.0 mph	pit 13-2) mination xhibit 13 (Exhibit	-12) 13-12)		
$D_R = 5.475 + 0.00734 \text{ v}$ $D_R = (\text{pc/mi/ln})$ .0S = (Exhibit 13-2) <b>Speed Determinatio</b> $M_S = (\text{Exibit 13-11})$	<u>n</u> 1) 1)			$LOS = D$ <b>Speed L</b> $D_{s} = 0$ $S_{R} = 54$ $S_{0} = 60$	Deter .336 (E 4.0 mph 0.7 mph	oit 13-2) <b>minatio</b> xhibit 13	-12) 13-12) 13-12)		

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed	AJR Atkins 7/25/2014		Highway/Direction of Trave From/To Jurisdiction	2100 - F	PAR Off to PAR On
Analysis Time Period	AM Peak		Analysis Year	2038 Bu Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	2850	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 8	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub> E <sub>T</sub>	1.00 1.5		$E_R$ $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1.2	
Speed Inputs	1.0		Calc Speed Adj and		
Lane Width		ft	Care opoca / taj arra		
Rt-Side Lat. Clearance		ft	f <sub>LW</sub>		mph
Number of Lanes, N	3		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			r
LOS and Performanc	e Measures	<b>3</b>	Design (N)		
<u>Operational (LOS)</u> v <sub>p</sub> = (V or DDHV) / (PHF x I	N x f <sub>HV</sub>		Design (N) Design LOS		
x f <sub>p</sub> ) S	60.0	pc/h/ln mph	$v_p = (V \text{ or DDHV}) / (PHF x x f_p)$	NXT <sub>HV</sub>	pc/h/ln
D = v <sub>p</sub> / S	18.3	pc/mi/ln	S		mph
LOS	C	ролили	$D = v_p / S$ Required Number of Lanes	s N	pc/mi/ln
Glossary			Factor Location		
	e ence	nd	i dotor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed			$E_R$ - Exhibits 11-10, 11-12 $E_T$ - Exhibits 11-10, 11-11, $f_p$ - Page 11-18 LOS, S, FFS, $v_p$ - Exhibits	11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1
DDHV - Directional design Copyright © 2012 University of Floric		rved	HCS 2010 <sup>TM</sup> Version 6.41	Gene	rated: 12/9/2014 2:14 F

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed	AJR Atkins 7/25/2014		Highway/Direction of Trave From/To Jurisdiction	2100 - F	PAR Off to PAR On uild - River Center
Analysis Time Period	PM Peak		Analysis Year	Site	
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			es.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	4992	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 7	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1)] 0.966	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	3		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	l FFS	60.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performanc	e Measures	5	Design (N)		
Operational (LOS) v <sub>p</sub> = (V or DDHV) / (PHF x I	N x f <sub>HV</sub> 1914	pc/h/ln	Design (N) Design LOS v <sub>p</sub> = (V or DDHV) / (PHF x	N x f <sub>HV</sub>	no/b/ln
x f <sub>p</sub> )	58.2	mnh	x f <sub>p</sub> )		pc/h/ln
S D = v <sub>p</sub> / S	32.9	mph pc/mi/ln	S		mph
LOS	32.9 D	μο/πι/π	D = v <sub>p</sub> / S	- N	pc/mi/ln
			Required Number of Lanes	5, IN	
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed	BFFS - Ba		$E_R$ - Exhibits 11-10, 11-12 $E_T$ - Exhibits 11-10, 11-11, $f_p$ - Page 11-18 LOS, S, FFS, $v_p$ - Exhibits 11-3	11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-11
DDHV - Directional design	nour volume		11-0		

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### RAMP ADD OR DROP LANE ANALYSIS (MAINLINE <55 MPH) ATKINS

#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 3/20/2014 2038 Build-River Center Site AM Peak Navy Base ICTF Freeway/Direction Junction Segment ID

WB US-52 & PAR Off Ramp US-52 & PAR WB Ramp Merge 2105

#### Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	1	1	1
Free-Flow Speed, FFS (mph)	55	55	45
Volume, V (veh/h)	988	1,089	101
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	5%	8%	41%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.98	0.96	0.83
Demand Flow Rate, $v_p$ (pc/h/ln)	1,125	1,258	135
Capacity Flow Rate, c (pc/h/ln)	2,200	2,200	2,100
v/c ratio	0.51	0.57	0.06
Density, D <sub>MD</sub> (pc/mi/ln)	19.7	22.0	2.4
LOS	В	C	А

#### Formulas and Reference Material

$$f_{HV}\,=\,$$

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

HCM 2010, Equation 11-2

$$D_{MD} =$$

HCM 2010, Equation 13-26

### Ramp Roadways Max Service Flow Rates

1 low hates					
	Capacity				
FFS (mi/h)	(pc/h/ln)				
> 50	2,200				
>40-50	2,100				
>30-40	2,000				
≥20-30	1,900				
<20	1,800				

Source: HCM 2010, Exhibit 13-10

#### Diverge LOS Thresholds

Bivorgo ECO Tiliodiloido						
	Density					
LOS	(pc/mi/ln)					
Α	≤10					
В	>10-20					
С	>20-28					
D	>28-35					
Е	>35					
F	v/c > 1					

# RAMP ADD OR DROP LANE ANALYSIS (MAINLINE <55 MPH) ATKINS

#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 3/20/2014 2038 Build-River Center Site PM Peak Navy Base ICTF Freeway/Direction Junction Segment ID

WB US-52 & PAR Off Ramp US-52 & PAR WB Ramp Merge 2105

Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	1	1	1
Free-Flow Speed, FFS (mph)	55	55	45
Volume, V (veh/h)	352	636	284
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	11%	22%	36%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.95	0.90	0.85
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	413	784	372
Capacity Flow Rate, c (pc/h/ln)	2,200	2,200	2,100
v/c ratio	0.19	0.36	0.18
Density, D <sub>MD</sub> (pc/mi/ln)	7.2	13.7	6.5
LOS	Α	В	А

#### Formulas and Reference Material

$$f_{HV} =$$

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

HCM 2010, Equation 11-2

$$D_{MD} =$$

HCM 2010, Equation 13-26

### Ramp Roadways Max Service

Flow Rates					
	Capacity				
FFS (mi/h)	(pc/h/ln)				
> 50	2,200				
>40-50	2,100				
>30-40	2,000				
≥20-30	1,900				
<20	1,800				

Source: HCM 2010, Exhibit 13-10

#### Diverge LOS Thresholds

Biroigo Eo o Tilloonolao					
	Density				
LOS	(pc/mi/ln)				
Α	≤10				
В	>10-20				
С	>20-28				
D	>28-35				
Е	>35				
F	v/c > 1				

			MPS AND	RAMP JUN			EET			
General	Infor	mation			Site Infor	mation				
Analyst		AJR		Fr	eeway/Dir of Tr	avel	I-26 WB			
Agency or C	, ,	Atkin	S	Jι	ınction		2110 - WB	PAR		
ate Perforr		7/25/			ırisdiction					
nalysis Tin				Aı	nalysis Year		2038 Build	- River Center Site	9	
	cription	Navy Base ICT	ſ <u>F</u>							
nputs			L							
Jpstream A	dj Ramp		I '	ber of Lanes, N	3					ream Adj
			Ramp Numbe	r of Lanes, N	1				Ramp	
Yes	On		Acceleration L	ane Length, L <sub>A</sub>	180				□Yes	On
✓ No	Off		Deceleration L	ane Length L <sub>D</sub>					- No	
			Freeway Volu	me, V <sub>F</sub>	2850				☑ No	Off
up =	ft		Ramp Volume		1089				L <sub>down</sub> =	ft
			1	Flow Speed, S <sub>FF</sub>	60.0					
′ <sub>u</sub> =	veh/h		1	ow Speed, S <sub>FR</sub>	45.0				$V_D =$	veh/h
20 01 10 11	oion t	- no/h IIn/		111	45.0					
onvers	SIOII LO	y pc/n one		Conditions	1		1	<del>- 1</del>	1	
(pc/l	า)	(Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	f <sub>p</sub>	v = V/P	$HF \times f_{HV} \times f_{p}$
reeway		2850	0.90	Level	8	0	0.962	1.00		3293
Ramp		1089	0.90	Level	8	0	0.962	1.00		1258
JpStream										
DownStrea	m									
			Merge Areas					Diverge Are	as	
stimat	ion of	V <sub>12</sub>				Estimat	ion of v	12		
		V <sub>12</sub> = V <sub>F</sub>	( P <sub>EM</sub> )				\	/ = \/ + (\/ -	. V \P	
L <sub>EQ</sub> = (Equation 13-6 or 13-7)						$V_{12} = V_R + (V_F - V_R)P_{FD}$				
$P_{FM} = 0.583$ using Equation (Exhibit 13-6)					1	$L_{EQ}$ = (Equation 13-12 or 13-13) $P_{FD}$ = using Equation (Exhibit 13-7)				
FD "							iation (Exhibit	(13-7)		
				on 13-14 or 13-		V <sub>12</sub> =		pc/h		
$^{\prime}_{3}$ or $V_{av34}$		17)	pom (Equalit	511 10 14 01 10		$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17) Is $V_3$ or $V_{av34} > 2,700$ pc/h? $\square$ Yes $\square$ No				
s V <sub>3</sub> or V <sub>av</sub>	<sub>34</sub> > 2,70	0 pc/h? Ye:	s 🗹 No							
s V <sub>3</sub> or V <sub>av</sub>	<sub>34</sub> > 1.5 *	V <sub>12</sub> /2	s 🗹 No			Is V <sub>3</sub> or V <sub>av3</sub>	<sub>34</sub> > 1.5 * V <sub>1</sub>	<sub>2</sub> /2 □Yes □		
Yes,V <sub>12a</sub> =				3-16, 13-18, or		If Yes,V <sub>12a</sub> =	:		ation 13-16,	13-18, or
		13-19)						13-19)		
Capacit	y Che	cks				Capacit				
		Actual	C	apacity	LOS F?		<i>P</i>	ctual	Capacity	LOS F?
						V <sub>F</sub>		Exhibit	13-8	
V <sub>F</sub>	<b>1</b>	4551	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>	Exhibit	13-8	
10						V <sub>R</sub>		Exhibi	t 13-	
								10		
low Er	tering	Merge In			1	Flow En	<u> </u>	Diverge Influ		
		Actual		Desirable	Violation?		Actua		Desirable	Violation?
V <sub>R1</sub>		3176	Exhibit 13-8	4600:All	No	V <sub>12</sub>	1	Exhibit 13		
		ice Detern		<u> </u>		-		e Determina	•	ot F)
D <sub>R</sub> =	5.475 +	0.00734 v <sub>R</sub> + 0	0.0078 V <sub>12</sub> - 0.0	00627 L <sub>A</sub>			$D_{R} = 4.25$	2 + 0.0086 V <sub>12</sub>	- 0.009 L <sub>D</sub>	
R = 28	8.5 (pc/m	i/ln)				$D_R = (p$	c/mi/ln)			
	(Exhibit	13-2)				1	xhibit 13-	2)		
	,	nination				Speed D				
•						<del>  '                                   </del>	xhibit 13-12			
M <sub>S</sub> = 0.398 (Exibit 13-11)								•		
S <sub>R</sub> = 52.8 mph (Exhibit 13-11)						.,	ph (Exhibit '			
0		Exhibit 13-11)				S <sub>0</sub> = mph (Exhibit 13-12)				
5 = 54	4.0 mph (	Exhibit 13-13)				S = m	ph (Exhibit	13-13)		
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			MPS AND	RAMP JUN			EET				
General	Infori	mation			Site Infor	mation					
Analyst		AJR		Fr	eeway/Dir of Tr	avel	I-26 WB				
Agency or C	, ,	Atkin	S		ınction	2110 - WB On from US-52 & PA					
Date Perforr		7/25/			ırisdiction						
Analysis Tim				Ar	nalysis Year		2038 Build	l - River Ce	nter Site		
	cription	Navy Base ICT	l <del>l</del>								
nputs			EN	hanafi anaa Ni							
Jpstream A	dj Ramp		I '	ber of Lanes, N	3					Downstre	am Adj
Yes	On		Ramp Numbe		1					Ramp	
⊥ res	□ On		Acceleration L	ane Length, L <sub>A</sub>	180					☐Yes	On
✓ No	Off		Deceleration L	ane Length L <sub>D</sub>						✓ No	Off
			Freeway Volu	me, V <sub>F</sub>	4992					INO	
up =	ft		Ramp Volume	, V <sub>R</sub>	636					L <sub>down</sub> =	ft
			1	-Flow Speed, S <sub>FF</sub>	60.0					,	
/ <sub>u</sub> =	veh/h		1	ow Speed, S <sub>FR</sub>	45.0					V <sub>D</sub> =	veh/h
CONVOY	sion to	nc/h Hn/		Conditions	70.0						
Julivers	SIOII LC	<i>γ ρ</i> υ/π υπο ∀		Conditions	1		Т				
(pc/h	1)	(Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>H\</sub>	/ <b>[</b>	f <sub>p</sub>	v = V/PHI	$= x f_{HV} x f_{p}$
Freeway		4992	0.90	Level	7	0	0.966	; <u> </u>	1.00	į	5741
Ramp		636	0.90	Level	22	0	0.901	_	1.00		784
JpStream											
DownStrea	m										
			Merge Areas						rge Areas		
stimat	ion of	V <sub>12</sub>				Estimat	ion of v	12			
		V <sub>12</sub> = V <sub>F</sub>	( P <sub>EM</sub> )				,	\/ = \/	+ (\/ - \/ `	/b	
L <sub>EQ</sub> = (Equation 13-6 or 13-7)					$V_{12} = V_R + (V_F - V_R)P_{FD}$						
P <sub>FM</sub> = 0.583 using Equation (Exhibit 13-6)					L <sub>EQ</sub> = (Equation 13-12 or 13-13)						
/ <sub>12</sub> =	FD							using Equation (Exhibit 13-7)			
			•	on 13-14 or 13-		V <sub>12</sub> =		pc/l			
$^{\prime}_{3}$ or $V_{av34}$		17)	po/ii (Equatio	511 10 14 61 10		$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17) Is $V_3$ or $V_{av34} > 2,700$ pc/h? $\square$ Yes $\square$ No					
s V <sub>3</sub> or V <sub>av</sub>	<sub>34</sub> > 2,700	0 pc/h? 🗌 Ye:	s 🗹 No								
s V <sub>3</sub> or V <sub>av</sub>	<sub>34</sub> > 1.5 *	V <sub>12</sub> /2	s 🗹 No			Is V <sub>3</sub> or V <sub>av3</sub>	<sub>34</sub> > 1.5 * V				
Yes,V <sub>12a</sub> =				3-16, 13-18, or		If Yes,V <sub>12a</sub> =	:		n (Equation	n 13-16, 1	3-18, or
		13-19)						13-1	9)		
Capacit	y Che	cks				Capacit	y Chec	ks			
		Actual	C	apacity	LOS F?			Actual		pacity	LOS F?
						V <sub>F</sub>			Exhibit 13-8	3	
V <sub>FC</sub>	,	6525	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>		Exhibit 13-8	3	
10						V <sub>R</sub>			Exhibit 13-	-	
									10		
-low En	tering		fluence A		1	Flow En					
		Actual		Desirable	Violation?		Actu		Max Desi	rable	Violation?
V <sub>R1</sub>		4128	Exhibit 13-8	4600:All	No	V <sub>12</sub>			xhibit 13-8		
			nination (i			-			rminatio		<i>F</i> )
D <sub>R</sub> =	5.475 +	0.00734 v <sub>R</sub> + 0	0.0078 V <sub>12</sub> - 0.0	00627 L <sub>A</sub>			$D_{R} = 4.25$	52 + 0.00	86 V <sub>12</sub> - 0.	009 L <sub>D</sub>	
) <sub>R</sub> = 36	6.2 (pc/mi	i/ln)				$D_R = (p$	c/mi/ln)				
	(Exhibit 1	13-2)				1	Exhibit 13	3-2)			
	,	nination				Speed D					
_						<del>  '                                   </del>	xhibit 13-1				
M <sub>S</sub> = 0.547 (Exibit 13-11)							•				
S <sub>R</sub> = 50.2 mph (Exhibit 13-11)						.,	ph (Exhibit				
0		Exhibit 13-11)			S <sub>0</sub> = mph (Exhibit 13-12)						
S = 5°	1.1 mph (	Exhibit 13-13)				S = m	ph (Exhibit	13-13)			
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AJR		lan		
AJR		Site Information		
Atkins 7/25/2014		Highway/Direction of Trave From/To Jurisdiction	2120 - L	JS-52 to Cosgrove
AM Peak		Analysis Year	Site	ma ravor corner
Base ICTF				
		Des.(N)	Plar	nning Data
3939	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 8	
	veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi	
tments				
1.00		E <sub>R</sub>	1.2	
1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1)] 0.962	
		Calc Speed Adj and	FFS	
	ft			
	ft	f		mph
3				mph
	ramps/mi			mph
60.0	mph	1	60.0	mph
	mph			
e Measures	)	Design (N)		
N x f <sub>HV</sub> 1517	pc/h/ln	Design (N) Design LOS v <sub>p</sub> = (V or DDHV) / (PHF x	N x f <sub>HV</sub>	20/12/12
60.0	mnh	x f <sub>p</sub> )		pc/h/ln
	•	s		mph
25.3 C	μωπιπ	$D = v_p / S$		pc/mi/ln
			s, N	
		Factor Location		
D - Dens FFS - Free BFFS - Ba	ity e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11, f <sub>p</sub> - Page 11-18	11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-11
	7/25/2014 AM Peak Base ICTF  3939  tments 1.00 1.5  3 60.0  Measures N x f <sub>HV</sub> 1517 60.0 25.3 C S - Spee D - Dens FFS - Free	AM Peak  Base ICTF  3939 veh/h veh/day  veh/h  tments  1.00 1.5  ft ft ft 3 ramps/mi 60.0 mph mph  e Measures  N x f <sub>HV</sub> 1517 pc/h/ln 60.0 mph 25.3 pc/mi/ln C  S - Speed D - Density FFS - Free-flow speed BFFS - Base free-flow	$AMPeak$ Jurisdiction $AMPeak$ Analysis Year $Base\ ICTF$ $\Box$ Des.(N) $\Box$ Peak-Hour Factor, PHF %Trucks and Buses, $P_T$ %RVs, $P_R$ General Terrain: Grade % Length Up/Down % Length Up/Down % $\Box$ Deside $\Box$ Desid	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed	AJR Atkins 7/25/2014		Highway/Direction of Trave From/To Jurisdiction	2120 - (	3 US-52 to Cosgrove uild - River Center
Analysis Time Period	PM Peak		Analysis Year	Site	
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Pla	nning Data
Flow Inputs					
Volume, V AADT	5628	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 7	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$		
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	3		$f_{LC}$		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			<b>.</b>
LOS and Performanc	e Measures	<b>S</b>	Design (N)		
Operational (LOS) v <sub>p</sub> = (V or DDHV) / (PHF x l	N x f <sub>HV</sub> 2157	pc/h/ln	Design (N) Design LOS v <sub>p</sub> = (V or DDHV) / (PHF x	N x f <sub>HV</sub>	no/h/ln
x f <sub>p</sub> )	E 1 1	na na ha	x f <sub>p</sub> )		pc/h/ln
S D = y / S	54.4 39.7	mph nc/mi/ln	s		mph
D = v <sub>p</sub> / S LOS	39.7 E	pc/mi/ln	$D = v_p / S$		pc/mi/ln
	E		Required Number of Lane	s, N	
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed DDHV - Directional design	BFFS - Ba		E <sub>R</sub> - Exhibits 11-10, 11-12 E <sub>T</sub> - Exhibits 11-10, 11-11 f <sub>p</sub> - Page 11-18 LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	, 11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-11

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		RAMP	S AND RAM	IP JUNCTI	ONS WOR	RKSI	HEET					
General Info	ormation		411	Site Infor								
Analyst	AJR		F	reeway/Dir of Tr		-26 WB						
Agency or Compar		S		unction			B Off to Cos	arove NB				
Date Performed	7/25/		Jı	urisdiction				<b>J</b>				
Analysis Time Peri	od AM P	'eak	А	nalysis Year	2	2038 Bu	ild - River C	enter Site				
Project Description	Navy Base ICT	F										
Inputs												
Upstream Adj	Ramp	Freeway Num	ber of Lanes, N	3					Downstrea	n Adj		
		Ramp Numbe	er of Lanes, N	1				F	Ramp			
□Yes	On	Acceleration I	ane Length, L <sub>A</sub>						Yes	On		
✓ No	Off	Deceleration I	Lane Length L <sub>D</sub>	525					<b>☑</b> No	Off		
		Freeway Volu	me, V <sub>F</sub>	3939					<b>™</b> INO	⊔Оп		
L <sub>up</sub> =	ft	Ramp Volume	e, V <sub>D</sub>	432				L	-down =	ft		
.,			-Flow Speed, S <sub>FF</sub>	60.0								
V <sub>u</sub> =	veh/h		low Speed, S <sub>FR</sub>	45.0					/ <sub>D</sub> =	veh/h		
Conversion	to nc/h lln/		111	10.0								
(pc/h)	V V	PHF	Terrain	%Truck	%Rv	T 4	HV	f <sub>p</sub>	/ = V/PHF :	v f v f		
. ,	(Veh/hr)	$\vdash$				-		· ·		· ·		
Freeway	3939	0.90	Level	8	0	0.9		1.00	455			
Ramp	432	0.90	Level	13	0	0.9	39	1.00	51	1		
UpStream		$\vdash$				$\vdash$						
DownStream		I I Merge Areas					l Div	erge Areas				
Estimation (		merge / treue			Estimation	on of		orge racus				
		(D)							\D			
	$V_{12} = V_F$	1 101			l.		12	$V_R + (V_F - V_R)$				
L <sub>EQ</sub> =		tion 13-6 or			L <sub>EQ</sub> =			quation 13-12				
P <sub>FM</sub> =	using	Equation (	Exhibit 13-6)		P <sub>FD</sub> =		0.62	3 using Equ	ation (Exhib	it 13-7)		
V <sub>12</sub> =	pc/h				V <sub>12</sub> =		3027	7 pc/h				
V <sub>3</sub> or V <sub>av34</sub>	pc/h (	Equation 13	-14 or 13-17)		$V_3$ or $V_{av34}$		1525	pc/h (Equa	tion 13-14	or 13-17)		
Is V <sub>3</sub> or V <sub>av34</sub> > 2,	700 pc/h? 🗌 Ye:	s 🗌 No			Is $V_3$ or $V_{av34} > 2,700$ pc/h? $\square$ Yes $\checkmark$ No							
Is V <sub>3</sub> or V <sub>av34</sub> > 1.	5 * V <sub>12</sub> /2	s 🗌 No			Is $V_3$ or $V_{av34} > 1.5 * V_{12}/2$ Yes V No							
If Yes,V <sub>12a</sub> =			-16, 13-18, or		If Yes,V <sub>12a</sub> = pc/h (Equation 13-16, 13-18, or 13							
	13-19)						19)					
Capacity Ch	,	-11			Capacity	Che	cks	The state of the s		,		
	Actual		Capacity	LOS F?			Actual		acity	LOS F?		
					V <sub>F</sub>		4552	Exhibit 13-8	6900	No		
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$	- V <sub>R</sub>	4041	Exhibit 13-8	6900	No		
					$V_R$		511	Exhibit 13-10	2100	No		
Flow Enteri	na Merae In	fluence A	\rea		Flow Ent	terin	a Divera	e Influenc	e Area			
	Actual		Desirable	Violation?			ctual	Max Desirabl		Violation?		
V <sub>R12</sub>		Exhibit 13-8			V <sub>12</sub>	3	027	Exhibit 13-8	4400:All	No		
Level of Ser	vice Detern	nination (	if not F)		<del></del>	Serv	ice Dete	ermination	(if not F	-)		
	0.00734 v <sub>R</sub> +				1			086 V <sub>12</sub> - 0.0		,		
D <sub>R</sub> = (pc/mi/	* *	12	А		L	6 (pc/i		12	U			
LOS = (Exhibi	,				1		,					
`					- ( ,							
	eed Determination  (Exibit 13-11)						Speed Determination D <sub>s</sub> = 0.344 (Exhibit 13-12)					
` `	*											
	xhibit 13-11)				***	-	-	-				
	xhibit 13-11)				1 '	-	(Exhibit 13	-				
S = mph (Ex	xhibit 13-13)				S = 56.	8 mph	(Exhibit 13	3-13)				
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		RAMP	S AND RAM	IP JUNCTI	ONS WO	RKSI	HEET					
General Info	rmation			Site Infor								
Analyst	AJR		F	reeway/Dir of Tr		-26 WB						
Agency or Compar		S		unction			B Off to Cos	arove NB				
Date Performed	7/25/2		Jı	urisdiction				<b>J</b>				
Analysis Time Peri	od PM P	eak eak	А	nalysis Year	2	2038 Bu	ild - River C	enter Site				
Project Description	Navy Base ICT	F										
Inputs												
Upstream Adj	Ramp	Freeway Num	ber of Lanes, N	3					Downstrea	m Adi		
		Ramp Numbe	er of Lanes, N	1					Ramp	٠,		
□Yes	On	Acceleration L	ane Length, L <sub>A</sub>						□Yes	On		
✓ No	Off	Deceleration I	Lane Length L <sub>D</sub>	525								
140		Freeway Volu	me, V <sub>r</sub>	5628					✓ No	Off		
L <sub>up</sub> =	ft	Ramp Volume	'	394				L	-down =	ft		
up			-, - <sub>R</sub> -Flow Speed, S <sub>FF</sub>									
V <sub>u</sub> =	veh/h		low Speed, S <sub>ER</sub>	45.0					√ <sub>D</sub> =	veh/h		
0			111	45.0								
Conversion	to pc/n Und			1	1	_						
(pc/h)	(Veh/hr)	PHF	Terrain	%Truck	%Rv	f	HV	f <sub>p</sub> v	/ = V/PHF :	x f <sub>HV</sub> x f <sub>p</sub>		
Freeway	5628	0.90	Level	7	0	0.9	66	1.00	647	72		
Ramp	394	0.90	Level	13	0	0.9	39	1.00	46	6		
UpStream												
DownStream		<u> </u>										
Estimation		Merge Areas			Ectimotic	00.01		erge Areas				
Estimation of					Estimation	OII OI						
	$V_{12} = V_{F}$	(P <sub>FM</sub> )					$V_{12} = V_{12}$	$'_{R}$ + $(V_{F} - V_{R})$	)P <sub>FD</sub>			
L <sub>EQ</sub> =	(Equa	tion 13-6 or	13-7)		L <sub>EQ</sub> =		(Ec	uation 13-12	2 or 13-13)			
P <sub>FM</sub> =	using	Equation (	Exhibit 13-6)		P <sub>FD</sub> =		0.57	7 using Equ	ation (Exhib	oit 13-7)		
V <sub>12</sub> =	pc/h				V <sub>12</sub> =		3930	pc/h				
V <sub>3</sub> or V <sub>av34</sub>	pc/h (	Equation 13	-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>		2542	pc/h (Equa	ation 13-14	or 13-17)		
Is V <sub>3</sub> or V <sub>av34</sub> > 2,	700 pc/h? ☐ Yes	s 🗆 No			Is V <sub>3</sub> or V <sub>av34</sub> > 2,700 pc/h? ☐ Yes ☑ No							
Is V <sub>3</sub> or V <sub>av34</sub> > 1.5					Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 * V <sub>12</sub> /2 ☐ Yes ☑ No							
			-16, 13-18, or		If Yes,V <sub>12a</sub> = pc/h (Equation 13-16, 13-18, or 13							
If Yes,V <sub>12a</sub> =	13-19)	· .					19)					
Capacity Ch	ecks				Capacity	Che	cks					
	Actual	C	apacity	LOS F?			Actual		acity	LOS F?		
					$V_{F}$		6472	Exhibit 13-8	6900	No		
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$	- V <sub>R</sub>	6006	Exhibit 13-8	6900	No		
					$V_R$		466	Exhibit 13-10	2100	No		
Flow Enterin	na Merae In	fluence A	l rea		+	terini	n Divera	e Influenc	e Area			
	Actual		Desirable	Violation?	1 1011 2111		ctual	Max Desirable		Violation?		
V <sub>R12</sub>		Exhibit 13-8			V <sub>12</sub>	$\overline{}$		Exhibit 13-8	4400:All	No		
Level of Ser	vice Detern		if not F)		+			rmination	(if not F	=)		
	0.00734 v <sub>R</sub> + (							086 V <sub>12</sub> - 0.0	•	,		
$D_R = (pc/mi/$	***	12	A		L	3 (pc/i		12 3.0	U			
LOS = (Exhibi	*				1		,					
`					LOS = D (Exhibit 13-2)							
	eed Determination						Speed Determination					
$M_S = (Exibit)$	•				$D_s$ = 0.340 (Exhibit 13-12) $S_R$ = 53.9 mph (Exhibit 13-12)							
S <sub>R</sub> = mph (E)	khibit 13-11)					-	-	-				
	khibit 13-11)				1	-	(Exhibit 13	-				
S = mph (E)	khibit 13-13)				S = 56.	1 mph	(Exhibit 13	3-13)				
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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	2135-Co NB On	osg NB Off to Cosg
Date Performed	7/25/2014		Jurisdiction		
Analysis Time Period	AM Peak		Analysis Year	2038 Bu Site	ild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plar	ning Data
Flow Inputs					
Volume, V AADT	3507	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 8	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length	Level mi	
			Up/Down %		
Calculate Flow Adjus	tments				
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] 0.962	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	3		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph		00.0	
LOS and Performanc	e Measures	 }	Design (N)		
			Design (N)		
Operational (LOS)			Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x I)$	N x f <sub>HV</sub> 1351	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f	
x f <sub>p</sub> )		p seemen	x f <sub>p</sub> )	пν	pc/h/ln
S	60.0	mph	S P		mph
$D = v_p / S$	22.5	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	С		Required Number of Lanes	s, N	p
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed			f Evhihit 11.0
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>p</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18	11 2	TRD - Page 11-11
speed	hourveluse		LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-∠,	
DDHV - Directional design	nour volume		1 0		

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	2135-Co NB On	osg NB Off to Cosg
Date Performed	7/25/2014		Jurisdiction		
Analysis Time Period	PM Peak		Analysis Year	2038 Bu Site	ild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			es.(N)	Plar	ning Data
Flow Inputs					
Volume, V AADT	5234	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 7	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length	Level mi	
Calaulata Flaur Adius	4		Up/Down %		
Calculate Flow Adjus					
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$		
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	3		$f_{LC}$		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performanc	e Measures	3	Design (N)		
			Design (N)		
Operational (LOS)	N. 6		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x I)$	N X <sup>†</sup> HV 2006	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	
x f <sub>p</sub> )			x f <sub>p</sub> )	110	pc/h/ln
S	57.0	mph	S		mph
$D = v_p / S$	35.2	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	E		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed			f
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>p</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		se free-flow	f <sub>p</sub> - Page 11-18	11.0	TRD - Page 11-1
speed			LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	
DDHV - Directional design	hour volume		11-3		

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Navy Base ICTF

			REEWAY	WEAV	1		T			
Genera	l Information	on			Site Info	rmation				
Analyst Agency/Cor Date Perfor Analysis Tir	med	AJR Atkins 7/25/20 AM Pea			Freeway/Dir of Travel I-26 WB Weaving Segment Location 2140 - Cosgrove NB to Cos. SB Analysis Year 2038 Build - River Center Site					
Inputs	cription Navy Do	ase io ir								
Weaving se Freeway fre	umber of lanes, Negment length, Lege- ee-flow speed, Ff	S FS		560ft 60 mph	Segment typ Freeway min Freeway maz Terrain type	imum speed			Freeway 15 2300 Leve	
Conver	sions to po	T .	r Base Co	ı	T .	1	1	1	1	
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	f <sub>HV</sub>	fp	v (pc/h)	
$V_{FF}$	3108	0.90	8	0	1.5	1.2	0.962	1.00	3591	
$V_{RF}$	874	0.90	19	0	1.5	1.2	0.913	1.00	1063	
$V_{FR}$	399	0.90	28	0	1.5	1.2	0.877	1.00	505	
$V_{RR}$	0	0.90	0	0	1.5	1.2	1.000	1.00	0	
$V_{NW}$	3591			-		_		V =	5159	
$V_{W}$	1568									
VR	0.304									
Configu	ıration Cha	aracteris	tics							
Minimum n	naneuver lanes, I	N <sub>WL</sub>		2 lc	Minimum we	aving lane cl	hanges, LC <sub>MIN</sub>		1568 lc/h	
Interchange	e density, ID			1.0 int/mi	Weaving lan	e changes, L	.C <sub>w</sub>		1743 lc/h	
Minimum R	F lane changes,	$LC_{RF}$		1 lc/pc	Non-weaving	g lane chang	es, LC <sub>NW</sub>		273 lc/h	
Minimum F	R lane changes,	$LC_{FR}$		1 lc/pc	Total lane ch	nanges, LC <sub>AL</sub>	L		2016 lc/h	
Minimum R	R lane changes,	, LC <sub>RR</sub>		lc/pc	Non-weaving	g vehicle inde	ex, I <sub>NW</sub>		201	
Weavin	g Segment	t Speed,	Density, I	Level of	Service,	and Cap	pacity			
Weaving se	egment flow rate	, V		5159 pc/h 7354 veh/h	Weaving inte	ensity factor, gment speed	W , S		0.621 42.6 mph	
	egment v/c ratio			0.675	Average wea	• .	**		42.8 mph	
	egment density, I	D	30	0.3 pc/mi/ln	Average nor		1444		42.5 mph	
Level of Se	rvice, LOS			D	Maximum w	eaving length	ı, L <sub>MAX</sub>		5626 ft	
Notes			4-d					: "		
Chapter 13,	segments longer the "Freeway Merge a es that exceed the	and Diverge Se	gments".			solated merge	and diverge ar	eas using the	procedures of	

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Navy Base ICTF

		F	REEWAY	WEAV	NG WOF	RKSHEE	Γ			
General	Information	on			Site Info	rmation				
Analyst Agency/Con Date Perforr Analysis Tin	med	AJR Atkins 7/25/20 PM Pe			Weaving Seg	Freeway/Dir of Travel I-26 WB Weaving Segment Location 2140 - Cosgrove NB to Cos. Analysis Year 2038 Build - River Center Si				
Project Desc Inputs	cription Navy Ba	ise ICTF								
Weaving con Weaving nu Weaving se Freeway free	mber of lanes, N gment length, L <sub>s</sub> e-flow speed, FF	rs		One-Sided 4 560ft 60 mph	Segment typ Freeway min Freeway max Terrain type	imum speed,			Freeway 15 2300 Leve	
Convers	sions to po	ı	i .	1	11	1		1	1	
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	f <sub>HV</sub>	fp	v (pc/h)	
$V_{FF}$	4343	0.90	7	0	1.5	1.2	0.966	1.00	4994	
$V_{RF}$	800	0.90	18	0	1.5	1.2	0.917	1.00	969	
$V_{FR}$	891	0.90	11	0	1.5	1.2	0.948	1.00	1044	
$V_RR$	0	0.90	0	0	1.5	1.2	1.000	1.00	0	
$V_NW$	4994							V =	7007	
$V_{W}$	2013									
VR	0.287									
Configu	ration Cha	racteris	tics							
Minimum m	aneuver lanes, N	$I_{WL}$		2 lc	Minimum we	eaving lane ch	nanges, LC <sub>MIN</sub>		2013 lc/h	
Interchange	density, ID			1.0 int/mi	Weaving lan	e changes, L	$C_{W}$		2188 lc/h	
Minimum R	F lane changes,	$LC_{RF}$		1 lc/pc	Non-weaving	g lane change	es, LC <sub>NW</sub>		562 lc/h	
Minimum FF	R lane changes,	LC <sub>FR</sub>		1 lc/pc	Total lane ch	nanges, LC <sub>ALI</sub>	_		2750 lc/h	
Minimum RI	R lane changes,	$LC_{RR}$		lc/pc	Non-weaving	g vehicle inde	ex, I <sub>NW</sub>		280	
Weaving	g Segment	Speed,	Density,	Level of	Service,	and Cap	acity			
Weaving se	gment flow rate,	V		7007 pc/h		ensity factor,			0.793	
Weaving se	gment capacity,	c <sub>w</sub>		7443 veh/h		gment speed,			37.9 mph	
Weaving se	gment v/c ratio			0.910		aving speed,	**		40.1 mph	
ľ	gment density, [	)	4	6.2 pc/mi/ln	1	n-weaving spe	****		37.1 mph	
Level of Ser	rvice, LOS			E	Maximum we	eaving length	, L <sub>MAX</sub>		5448 ft	
Notes										
Chapter 13, "	egments longer th Freeway Merge a es that exceed the	nd Diverge Se	gments".	· ·		solated merge	and diverge ar	eas using the	procedures of	

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	2145-Co SB On	osg SB Off to Cosg
Date Performed	7/25/2014		Jurisdiction		
Analysis Time Period	AM Peak		Analysis Year	2038 Bu Site	ild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			es.(N)	Plar	ning Data
Flow Inputs					
Volume, V AADT	3982	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 8	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D			%RVs, P <sub>R</sub> General Terrain:	0 Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments				
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] 0.962	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	3		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph		00.0	Прп
LOS and Performanc	e Measures	<del></del>	Design (N)		
			Design (N)		
Operational (LOS)			Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x   x f_p)$	N x f <sub>HV</sub> 1534	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	pc/h/ln
s	60.0	mph	x f <sub>p</sub> )		
$D = v_p / S$	25.6	pc/mi/ln	S		mph
LOS	С	·	$D = v_p / S$ Required Number of Lanes	s N	pc/mi/ln
Glossary			Factor Location	, . <b>.</b>	
N - Number of lanes	S - Spee	74 			
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>p</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18		TRD - Page 11-11
speed			LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	
DDHV - Directional design	hour volume		11-3		

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	2145-Co SB On	osg SB Off to Cosg
Date Performed	7/25/2014		Jurisdiction		
Analysis Time Period	PM Peak		Analysis Year	2038 Bu Site	ild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	☐ Plar	ning Data
Flow Inputs					
Volume, V AADT	5143	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 7	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments				
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] 0.966	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	3		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed,		mph		00.0	Прп
BFFS LOS and Performanc	o Magaziras	<u> </u>	Decign (N)		
LOS and Performanc	e weasures	•	Design (N)		
Operational (LOS)			Design (N)		
$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	//- //	Design LOS	NI v. f	
x f <sub>p</sub> )	1971	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N X I <sub>HV</sub>	pc/h/ln
s	57.5	mph	x f <sub>p</sub> )		
$D = v_p / S$	34.3	pc/mi/ln	S D = v / S		mph
LOS	D		$D = v_p / S$ Required Number of Lanes	e NI	pc/mi/ln
Glossary			Factor Location	, IN	
	S Snoo	nd.	Factor Location		
N - Number of lanes	S - Spee D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
V - Hourly volume		-	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate LOS - Level of service		e-flow speed ase free-flow	f <sub>p</sub> - Page 11-18		TRD - Page 11-11
speed	Di 1 O - De	AGC II CC-IIOVV	LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	
DDHV - Directional design	hour volume		11-3		
			<u> </u>		

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		RAI	MPS AND	RAMP JUNG	CTIONS W	ORKSHI	EET				
General	I Infor		37.1119		Site Infor						
Analyst Agency or C	Company	AJR Atkins		Ju	eeway/Dir of Tr nction	avel	I-26 W 2150 ·		m Cosgrove SB		
Date Perfor		7/25/2			risdiction		2020	Duile Dive	. Camban Cita		
Analysis Tin		AM P Navy Base ICT		AI	nalysis Year		2030	Bulla - River	Center Site		
Inputs	onption	Havy Base 101									
Upstream A	dj Ramp		· ·	ber of Lanes, N	3					Downstre	am Adj
☐Yes	On		Ramp Numbe	r of Lanes, N .ane Length, L₄	1 425					Ramp	
☑ No	☐ Off		ı	ane Length L <sub>D</sub>	420					✓ Yes	□ On
			Freeway Volu	me, V <sub>F</sub>	3982					□No	<b>✓</b> Off
L <sub>up</sub> =	ft		Ramp Volume	e, V <sub>R</sub>	184					L <sub>down</sub> =	2390 ft
·/ –			Freeway Free	-Flow Speed, S <sub>FF</sub>	60.0					V <sub>D</sub> =	371 veh/h
V <sub>u</sub> =	veh/h		Ramp Free-Fl	ow Speed, S <sub>FR</sub>	45.0					V <sub>D</sub> –	on venin
Conver	sion to			Conditions							
(pc/l		V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	f <sub>p</sub>	v = V/PH	F x f <sub>HV</sub> x f <sub>p</sub>
Freeway		3982	0.90	Level	8	0	(	).962	1.00		4601
Ramp		184	0.90	Level	24	0	(	).893	1.00		229
UpStream											
DownStrea	m	371	0.90 Merge Areas	Level	21	0		).905	1.00		456
Estimat		Estimat	ion (		Diverge Areas						
		V <sub>12</sub> = V <sub>F</sub> (	( P <sub>EM</sub> )					\/ - \	\/ ± (\/ \/	\D	
L <sub>EQ</sub> =				13-6 or 13-7)					V <sub>R</sub> + (V <sub>F</sub> - V <sub>R</sub> (Equation 13-		12)
P <sub>FM</sub> =				ion (Exhibit 13-6)		L <sub>EQ</sub> = D =			∟cquation 13- using Equatio		
V <sub>12</sub> =		2755 p		,		P <sub>FD</sub> = V <sub>12</sub> =			oc/h	II (EXIIIDIL I	3-1)
V <sub>3</sub> or V <sub>av34</sub>				on 13-14 or 13-		$V_{12}^{-12}$ $V_{3}$ or $V_{av34}$			pc/h (Equation 1	3_1/1 or 13_	17)
		17)	_				> 2		Yes □No	3-14-01-13-	17)
		0 pc/h? Tyes							Yes No		
Is V <sub>3</sub> or V <sub>av</sub> If Yes,V <sub>12a</sub> =		V <sub>12</sub> /2 ☐ Yes pc/h ( 13-19)		3-16, 13-18, or		If Yes,V <sub>12a</sub> =		1	oc/h (Equation 3-19)	n 13-16, 1	13-18, or
Capacit	v Che					Capacit	v Ch	ecks			
Jupuon	.y 0c	Actual		apacity	LOS F?	Jupuon	,	Actual	Car	pacity	LOS F?
				, ,		V <sub>F</sub>			Exhibit 13-8		
V <sub>F</sub>		4830	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>		Exhibit 13-8	3	
V F	0	4030	EXHIBIT 13-0		NO	V <sub>R</sub>	IX		Exhibit 13-		1
Flow Fr	nterinc	Merge In	fluence A	rea		Flow Fn	teri	na Dive	<u> </u>	ce Area	<u> </u>
		Actual		Desirable	Violation?		1	Actual	Max Desi		Violation?
V <sub>R1</sub>	2	2984	Exhibit 13-8	4600:AII	No	V <sub>12</sub>	$\top$		Exhibit 13-8		
		ice Detern	nination (	if not F)		Level of	Ser	vice De	terminatio	n (if no	t F)
		0.00734 v <sub>R</sub> + 0	•			1			.0086 V <sub>12</sub> - 0.		
O <sub>R</sub> = 20	6.0 (pc/m	i/ln)				$D_R = (p$	c/mi/	ln)			
	(Exhibit	13-2)				LOS = (E	xhibi	it 13-2)			
Speed L	Detern	nination				Speed Determination					
_	.360 (Exit					1-1		13-12)			
Ü		Exhibit 13-11)						, hibit 13-12)			
11		Exhibit 13-11)				'''		(hibit 13-12)			
		Exhibit 13-11)				ľ		hibit 13-13)			
			Rights Reserve			HCS2010 <sup>TI</sup>				0	12/9/2014 2:2

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Analyst			RAI	MPS AND	RAMP JUN	CTIONS W	ORKSHE	EET				
Agency or Company   Akins   Almotion   Analysis Year   2038 Build - River Center Site	General	I Infor		• /	10 1111							
Page 2	Analyst Agency or C	Company	AJR Atkins		Ju	eeway/Dir of Tr	avel			m Cosgrove SB		
Project Description   Navy Base   CTF								2038	Build - River	Center Site		
Description Adj Ramp	Project Des	cription	Navy Base ICT	F		•						
Accession   Ramp   Ramp Number of Lanes, N   1   Ramp   Ramp Number of Lanes, N   1   Accession   Lane Length, L   425   Ves   O   No   Off   Deceleration Lane Length, L   425   Ves   O   No   Ves   Ves   Ves   O   No   Ves   Ves   Ves   O   No   Ves	Inputs											
Yes	Upstream A	ıdj Ramp		l '								am Adj
Freeway Volume, V <sub>F</sub>   5143	Yes	On	l	Acceleration I	ane Length, L <sub>A</sub>	•					l '	On
V <sub>V</sub> = veh/h         Ramp Volume, V <sub>R</sub> 373         July = 2390         V <sub>VD</sub> = 447 v         V <sub>D</sub> = 447 v <td>☑ No</td> <td>☐ Off</td> <td></td> <td>ı</td> <td>- 5</td> <td>51//3</td> <td></td> <td></td> <td></td> <td></td> <td>□No</td> <td>✓ Off</td>	☑ No	☐ Off		ı	- 5	51//3					□No	✓ Off
Vu = veh/h         Freeway Free-Flow Speed, S <sub>FF</sub> Ann Free-Flow Speed, S <sub>FF</sub> Ann Free-Flow Speed, S <sub>FR</sub> Ann Free-Flow Speed	=	ft		1							L <sub>down</sub> =	2390 ft
Conversion to pc/h Under Base Conditions	ир			1								
(pc/h)	√ <sub>u</sub> =	veh/h									$V_D =$	447 veh/h
(pch)	Conver	sion to				45.0						
(pch)   (Veh/hr)   PHF   Terrain   %Truck   %RV   T <sub>HV</sub>   T <sub>p</sub>   V = VIPHF X T <sub>HV</sub>   Freeway   5143   0.90   Level   7   0   0.966   1.00   5914   345   5914   373   0.90   Level   10   0   0.952   1.00   435   43						0/	2/5		_	ŕ	\//D!!	Fuf : f
Ramp   373   0.90   Level   10   0   0.952   1.00   435     UpStream	(pc/l	h)	(Veh/hr)	PHF	Terrain	%Truck	%Rv		† <sub>HV</sub>	t <sub>p</sub>	v = V/PH	Fxt <sub>HV</sub> xt <sub>p</sub>
DownStream			5143	0.90	Level	7	<u> </u>	_		1.00		5914
DownStream	<u> </u>		373	0.90	Level	10	0		).952	1.00		435
Stimation of V12		ım	117	0.00	Lovel	15		+	030	1.00		E24
Estimation of $v_{12}$   Estimation of $v_{12}$   $v_{12} = v_{F} (P_{FM})$   $v_{12} = v_{FM} (P_{FM})$   $v_{13} = v_{FM} (P_{FM})$   $v_{14} $	DownStrea	ım			Level	15	0	(				534
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Estimat	vierge Areas		Estimati	ion (		iverge Areas					
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$			V <sub>12</sub> = V <sub>E</sub>	( P <sub>EM</sub> )					\/ - \	\/ ± (\/ \/	\D	
Product   Pro	- <sub>EO</sub> =				13-6 or 13-7)		_					12)
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$					(=:::::::::::::::::::::::::::::::::::::						iii (Exilibit i	3-1)
17					on 13-14 or 13-						2 11 12	47)
$ S \lor_3 \text{ or } \lor_{av34} > 1.5 * \lor_{12}/2    Yes \mid   No \\  f \lor es, \lor_{12a} =    S \lor_{13}/2 \mid   Yes \mid   No \\  f \lor es, \lor_{12a} =    S \lor_{13}/2 \mid   Yes \mid   Y$			17)					× 2			3-14 01 13-	17)
Capacity Checks  Actual Capacity LOS F? Actual Capacity LOS F?  V <sub>F</sub> Exhibit 13-8  V <sub>FO</sub> 6349 Exhibit 13-8  No V <sub>FO</sub> = V <sub>F</sub> · V <sub>R</sub> Exhibit 13-8  No Entering Merge Influence Area  Actual Max Desirable Violation?  V <sub>R12</sub> 4027 Exhibit 13-8 4600:All No V <sub>12</sub> Exhibit 13-8  Level of Service Determination (if not F)  D <sub>R</sub> = 5.475 + 0.00734 v <sub>R</sub> + 0.0078 V <sub>12</sub> - 0.00627 L <sub>A</sub> D <sub>R</sub> = 34.0 (pc/mi/ln)  .0S = D (Exhibit 13-2)  Speed Determination  M <sub>S</sub> = 0.502 (Exhibit 13-11)  S <sub>R</sub> = 51.0 mph (Exhibit 13-11)  Capacity Checks  Capacity Checks  V <sub>F</sub> Actual Capacity LOS F?  Actual Capacity LOS F?  Actual Capacity LOS F?  Actual Capacity LOS F?  V <sub>F</sub> Exhibit 13-8  V <sub>F</sub> Exhibit 13-8  V <sub>F</sub> Exhibit 13-8  V <sub>F</sub> Exhibit 13-8  D <sub>R</sub> Exhibit 13-8  D <sub>R</sub> = 4.252 + 0.0086 V <sub>12</sub> - 0.009 L <sub>D</sub> D <sub>R</sub> = (pc/mi/ln)  D <sub>R</sub> = (pc/mi/ln)  Speed Determination  Speed Determination  S <sub>R</sub> = mph (Exhibit 13-12)					3-16, 13-18, or				1	oc/h (Equation	n 13-16, 1	3-18, or
$V_{FO} = \begin{cases} Actual & Capacity & LOS F? \\ Actual & Capacity & LOS F? \\ V_{FO} = V_{F} - V_{R} & Exhibit 13-8 \\ V_{R} & V_{R} & V_{R} & V_{R} \\ V_{R} & V_{R} & V_{R} \\ V_{R} & V_{R} & V_{R} \\ V_{R} & V_{R} & V_{R} & V_{R} \\ V_{R} & V_{R} & V_{R} & V_{R} \\ V_{R} & V_{R} & V_{R} & V_{R} \\ V_{R} & V_{R} & V_{R} & V_{R} \\ V_{R} & V_{R} & V_{R} $										3-19)		
$V_{FO} = V_{F} - V_{R} = \frac{\text{Exhibit } 13-8}{\text{Exhibit } 13-8} = \frac{V_{F}}{V_{FO}} = V_{F} - V_{R} = \frac{\text{Exhibit } 13-8}{\text{Exhibit } 13-8} = \frac{V_{FO}}{V_{R}} = V_$	Capacit	ty Che	-				Capacity	y Ch				
$V_{FO} = V_F - V_R                                  $			Actual		Capacity	LOS F?	.,		Actual			LOS F?
Flow Entering Merge Influence Area  Actual Max Desirable Violation? $V_{R12}$ 4027 Exhibit 13-8 4600:All No $V_{12}$ Exhibit 13-8 Exhibit 13-8   Level of Service Determination (if not F) $D_R = 5.475 + 0.00734 \text{ v}_R + 0.0078 \text{ V}_{12} - 0.00627 \text{ L}_A$ $D_R = 34.0 \text{ (pc/mi/ln)}$ $D_R = 34.0 \text{ (pc/mi/ln)}$ $D_R = 0.502 \text{ (Exhibit 13-11)}$ $D_R = 0.502 \text{ (Exhibit 13-12)}$ $D_R = 0.502 \text{ (Exhibit 13-11)}$												
VR	V <sub>F</sub>	0	6349	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>				
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$							V <sub>R</sub>				-	
$V_{R12}$ 4027         Exhibit 13-8         4600:All         No $V_{12}$ Exhibit 13-8           Level of Service Determination (if not F)         Level of Service Determination (if not F) $D_R = 5.475 + 0.00734 \text{ v}_R + 0.0078 \text{ V}_{12} - 0.00627 \text{ L}_A$ $D_R = 4.252 + 0.0086 \text{ V}_{12} - 0.009 \text{ L}_D$ $D_R = 34.0 \text{ (pc/mi/ln)}$ $D_R = (\text{pc/mi/ln})$ $LOS = D$ (Exhibit 13-2) $LOS = (\text{Exhibit 13-2})$ Speed Determination         Speed Determination $M_S = 0.502 \text{ (Exibit 13-11)}$ $D_S = (\text{Exhibit 13-12})$ $S_R = 0.51.0 \text{ mph (Exhibit 13-11)}$ $S_R = 0.51.0 \text{ mph (Exhibit 13-12)}$	Flow Er	ntering	g Merge In	fluence A	\rea		Flow En	terii	ng Dive	rge Influen	ce Area	1
Level of Service Determination (if not F)       Level of Service Determination (if not F) $D_R = 5.475 + 0.00734  v_R + 0.0078  V_{12} - 0.00627  L_A$ $D_R = 4.252 + 0.0086  V_{12} - 0.009  L_D$ $D_R = 34.0  (\text{pc/mi/ln})$ $D_R = (\text{pc/mi/ln})$ $LOS = D  (\text{Exhibit 13-2})$ $LOS = (\text{Exhibit 13-2})$ Speed Determination       Speed Determination $M_S = 0.502  (\text{Exibit 13-11})$ $D_S = (\text{Exhibit 13-12})$ $S_R = 0.502  (\text{Exhibit 13-11})$ $S_R = 0.502  (\text{Exhibit 13-12})$			Actual	Max	Desirable	Violation?			Actual	Max Desi	irable	Violation?
$ D_{R} = 5.475 + 0.00734 \text{ v}_{R} + 0.0078 \text{ V}_{12} - 0.00627 \text{ L}_{A} $ $ D_{R} = 4.252 + 0.0086 \text{ V}_{12} - 0.009 \text{ L}_{D} $ $ D_{R} = 34.0 \text{ (pc/mi/ln)} $ $ D_{R} = (\text{pc/mi/ln}) $ $ D_{R}$			-			No		$\perp$				
$D_{\rm R} = 34.0  ({\rm pc/mi/ln})$ $D_{\rm R} = ({$				•			1					t <b>F</b> )
$\begin{array}{lll} \text{OS} = & \text{D (Exhibit 13-2)} & \text{LOS} = & \text{(Exhibit 13-2)} \\ \textbf{Speed Determination} & \textbf{Speed Determination} \\ \textbf{M}_{\text{S}} = & 0.502 \text{ (Exibit 13-11)} & \textbf{D}_{\text{S}} = & \text{(Exhibit 13-12)} \\ \textbf{S}_{\text{R}} = & 51.0 \text{ mph (Exhibit 13-11)} & \textbf{S}_{\text{R}} = & \text{mph (Exhibit 13-12)} \\ \end{array}$	D <sub>R</sub> =	= 5.475 +	0.00734 v <sub>R</sub> + 0	0.0078 V <sub>12</sub> - 0.	00627 L <sub>A</sub>		[	D <sub>R</sub> =	4.252 + 0	.0086 V <sub>12</sub> - 0.	.009 L <sub>D</sub>	
Speed DeterminationSpeed Determination $M_S = 0.502$ (Exibit 13-11) $D_s = (Exhibit 13-12)$ $S_R = 51.0$ mph (Exhibit 13-11) $S_R = mph$ (Exhibit 13-12)	$O_R = 34$	4.0 (pc/m	i/ln)				$D_R = (p$	c/mi/	ln)			
$M_{\rm S} = 0.502  ({\rm Exibit  13-11})$ $D_{\rm S} = ({\rm Exhibit  13-12})$ $S_{\rm R} = 51.0  {\rm mph}  ({\rm Exhibit  13-12})$	OS = D	(Exhibit	13-2)				LOS = (E	xhibi	it 13-2)			
$M_{\rm S} = 0.502  ({\rm Exibit}  13-11)$ $D_{\rm S} = ({\rm Exhibit}  13-12)$ $S_{\rm R} = 51.0  {\rm mph}  ({\rm Exhibit}  13-11)$ $S_{\rm R} = {\rm mph}  ({\rm Exhibit}  13-12)$	Speed L	Detern	nination				Speed D	ete	rminatio	on		
S <sub>R</sub> = 51.0 mph (Exhibit 13-11) S <sub>R</sub> = mph (Exhibit 13-12)	_											
	•						1					
-[] VV.V.IIIpri (=2000/it IV 11)	11											
S = 51.8 mph (Exhibit 13-13) S = mph (Exhibit 13-13)			,				ľ	,	,			
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		RAMP	S AND RAI	/IP JUNCTI	ONS WO	ORKS	HEET				
General Infor	mation			Site Infor							
Analyst	AJR		F	reeway/Dir of Tr	avel	I-26 W	3				
Agency or Company	Atkin	S		Junction		2160-V	/B Off to D	orchester			
Date Performed	3/20/			Iurisdiction							
Analysis Time Period			<i>F</i>	Analysis Year		2038 B	uild - River	Center Site			
Project Description	Navy Base IC	ΓF									
Inputs		Tra a a N	haraflanas N								
Upstream Adj R	amp	1 '	ber of Lanes, N	3					Downstrea	n Adj	
✓ Yes	On	Ramp Number	*	1					Ramp		
™ res ™	JOII	Acceleration L	ane Length, L <sub>A</sub>						Yes	On	
□No□	Off	Deceleration L	ane Length L <sub>D</sub>	425					✓ No	Off	
		Freeway Volu	me, V <sub>F</sub>	4166					INO		
L <sub>up</sub> = 23	90 ft	Ramp Volume	, V <sub>R</sub>	371				I	L <sub>down</sub> =	ft	
		Freeway Free	-Flow Speed, S <sub>FF</sub>	60.0				ļ	\	. 1. //-	
$V_u = 18$	45.0					V <sub>D</sub> =	veh/h				
Conversion to	o pc/h Uni		ow Speed, S <sub>FR</sub>								
(pc/h)	V	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	f <sub>p</sub>	v = V/PHF :	of vf	
. ,	(Veh/hr)					_		-		19	
Freeway	4166	0.90	Level	7	0	_	966	1.00	479		
Ramp	371	0.90	Level	21	0	_	905	1.00	450		
UpStream	184	0.90	Level	24	0	0.	893	1.00	229	9	
DownStream		 Merge Areas						iverge Areas			
Estimation of		ivier ge Areas			Estimat	tion o		iverge Areas			
		/ D \						\/ . (\/ \/	\D		
	$V_{12} = V_F$		:					$V_R + (V_F - V_R)$			
L <sub>EQ</sub> =		ation 13-6 or			L <sub>EQ</sub> =			62.75 (Equation			
P <sub>FM</sub> =	using	Equation (E	Exhibit 13-6)		P <sub>FD</sub> =		0.	619 using Equ	iation (Exhib	it 13-7)	
V <sub>12</sub> =	pc/h				V <sub>12</sub> =		31	40 pc/h			
V <sub>3</sub> or V <sub>av34</sub>	pc/h (	Equation 13-	-14 or 13-17)		$V_3$ or $V_{av34}$		16	51 pc/h (Equa	ation 13-14	or 13-17)	
Is $V_3$ or $V_{av34} > 2,70$	0 pc/h? 🔲 Ye	s 🗌 No			Is V <sub>3</sub> or V <sub>av</sub>	<sub>v34</sub> > 2,7	00 pc/h? [	Yes <b>☑</b> No			
Is $V_3$ or $V_{av34} > 1.5$	'V <sub>12</sub> /2 □ Ye	s 🗌 No			Is $V_3$ or $V_{av34} > 1.5 * V_{12}/2$ Yes $\checkmark$ No						
If Yes,V <sub>12a</sub> =			-16, 13-18, or		If Yes,V <sub>12a</sub>	=		c/h (Equation	13-16, 13-1	8, or 13-	
	13-19)						19	3)			
Capacity Che	ı	1 0		1 100 50	Capacit	ly Chi		0	:	LLOGEO	
	Actual	<del>                                     </del>	apacity	LOS F?	1/		Actual		pacity	LOS F?	
					V <sub>F</sub>		4791	Exhibit 13-8		No	
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{I}$		4335	Exhibit 13-8		No	
					V <sub>R</sub>		456	Exhibit 13-10	2100	No	
Flow Entering	g Merge In	fluence A	rea		Flow E	nterin	g Dive	ge Influend			
	Actual		Desirable	Violation?		/	Actual	Max Desirab	le	Violation?	
V <sub>R12</sub>		Exhibit 13-8			V <sub>12</sub>	3	3140	Exhibit 13-8	4400:All	No	
Level of Serv	ice Detern	nination (i	if not F)		Level o	f Serv	vice De	termination	ı (if not F	)	
$D_R = 5.475 + 0.$	00734 v <sub>R</sub> +	0.0078 V <sub>12</sub> -	0.00627 L <sub>A</sub>			$D_R = 4$	.252 + 0	.0086 V <sub>12</sub> - 0.0	009 L <sub>D</sub>		
D <sub>R</sub> = (pc/mi/ln	)				$D_R = 2$	7.4 (pc	/mi/ln)				
LOS = (Exhibit	13-2)				LOS = C	(Exhib	oit 13-2)				
Speed Detern						<u> </u>		on .			
$M_S = (Exibit 1)$					Speed Determination D <sub>s</sub> = 0.339 (Exhibit 13-12)						
	ibit 13-11)				S <sub>R</sub> = 53.9 mph (Exhibit 13-12)						
					$S_0$ = 63.3 mph (Exhibit 13-12)						
0	ibit 13-11)				I .						
	,						S = 56.8 mph (Exhibit 13-13)  HCS2010 <sup>TM</sup> Version 6.41 Generated: 12/9/2014 2:30				
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General In	formation			Site Infor	mation					
Analyst	AJR		F	reeway/Dir of Tr		I-26 WI	3			
Agency or Comp				unction			VB Off to Do	rchester		
Date Performed	•	/2014	Jı	urisdiction						
Analysis Time P	eriod PM F	Peak	A	nalysis Year		2038 B	uild - River	Center Site		
Project Descript	ion Navy Base IC	TF								
Inputs										
Upstream A	Adj Ramp	1	ber of Lanes, N	3					Downstre	am Adj
✓Yes	<b>☑</b> On	Ramp Number Acceleration I	ane Length, $L_{\Delta}$	1					Ramp    Yes	□On
□No	Off		ane Length L <sub>D</sub>	425					☑ Yes	Off
I -	0200 #	Freeway Volu		5516						ft
L <sub>up</sub> =	2390 ft	Ramp Volume	11	447					L <sub>down</sub> =	11
V <sub>u</sub> =	373 veh/h		-Flow Speed, $S_{FF}$ ow Speed, $S_{FR}$	60.0 45.0					V <sub>D</sub> =	veh/h
Convorsio	n to pc/h Un		111							
				1		1	, 1	_		
(pc/h)	(Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	f <sub>p</sub>	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>
Freeway	5516	0.90	Level	6	0	0.	971	1.00	6	313
Ramp	447	0.90	Level	15	0	0.	930	1.00		534
UpStream	373	0.90	Level	10	0	0.	952	1.00	4	135
DownStream										
<b>-</b> 41 41		Merge Areas			F - 4' 4		Di	verge Areas		
Estimatior	1 of V <sub>12</sub>				Estimat	ion o	T V <sub>12</sub>			
	$V_{12} = V_{F}$	(P <sub>FM</sub> )					V <sub>12</sub> =	$V_R + (V_F - V_F)$	R)P <sub>FD</sub>	
- <sub>EQ</sub> =	(Equa	ation 13-6 or	13-7)		L <sub>EQ</sub> =		247	77.01 (Equati	on 13-12	or 13-13)
P <sub>FM</sub> =	using	Equation (I	Exhibit 13-6)		P <sub>FD</sub> =		0.5	81 using Equ	uation (Exh	nibit 13-7)
V <sub>12</sub> =	pc/h		,		V <sub>12</sub> =			90 pc/h	,	,
√ <sub>3</sub> or V <sub>av34</sub>		(Equation 13	-14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>			23 pc/h (Equ	ation 13 1	1 or 13 17
	2,700 pc/h? ☐ Ye		-14-01-13-17)			<b>&gt;27</b>			allon 13-1	4 01 13-17
								Yes ☑No		
	1.5 * V <sub>12</sub> /2  Ye		16 12 10 or		"			Yes ☑ No	10 16 10	10 or 12
f Yes,V <sub>12a</sub> =	13-19		-16, 13-18, or		If Yes,V <sub>12a</sub> =	=	ρι 19	c/h (Equation )	13-10, 13	)-10, UI 13-
Capacity C		,			Capacit	v Ch		/		
	Actual	1 0	apacity	LOS F?			Actual	Ca	pacity	LOS F
					V <sub>F</sub>		6313	Exhibit 13-8		No
$V_{FO}$		Exhibit 13-8			V <sub>FO</sub> = V <sub>F</sub>	- V <sub>R</sub>	5779	Exhibit 13-8	6900	No
					V <sub>R</sub>	- 1	534	Exhibit 13-1	0 2100	No
Flow Ento	ring Merge In	nfluence 4	rea			nterin		ge Influen		
1011 LIILE	Actual	· ·	Desirable	Violation?			Actual	Max Desirab		Violation
V <sub>R12</sub>	7.1014011	Exhibit 13-8	,		V <sub>12</sub>	$\neg$	8890	Exhibit 13-8	4400:All	No
	ervice Detern		if not E					erminatio		
ים ומעם ו					1			0086 V <sub>12</sub> - 0.	•	• /
		0.0076 V <sub>12</sub>	0.00021 LA					0000 v <sub>12</sub> - 0.	ooa rD	
D <sub>R</sub> = 5.475	a:/la)				I	3.9 (pc				
$D_{R} = 5.475$ $D_{R} = (pc/n)$					LOS = D	(Exhib	oit 13-2)			
D <sub>R</sub> = 5.475 D <sub>R</sub> = (pc/n _OS = (Exh	ibit 13-2)									
D <sub>R</sub> = 5.475 D <sub>R</sub> = (pc/n _OS = (Exh					Speed L	Deter				
$D_R = 5.475$ $D_R = (pc/n)$ $LOS = (Exh$ <b>Speed Det</b>	ibit 13-2)				Speed L	<b>Deter</b> .346 (E	xhibit 13-	12)		
$D_R = 5.475$ $D_R = (pc/n)$ $LOS = (Exh)$ $R = (Exh)$ $R = (Exh)$	ibit 13-2)				Speed L	<b>Deter</b> .346 (E		12)		
$D_R = 5.475$ $D_R = (pc/n)$ $LOS = (Exh)$ $COS = (Exh)$	termination bit 13-11)				<b>Speed L</b> D <sub>s</sub> = 0. S <sub>R</sub> = 5.	<b>Deter</b> .346 (E 3.8 mph	xhibit 13-	12) 13-12)		

F-4392

BASIC FRI	EEWAY SE	GMENTS WORKSHEE	Т	
		Site Information		
AJR			el <i>I-26 WB</i>	
Atkins		-	2165-D	orches Off to
			Dorches	s On
AM Peak		Analysis Year	2038 Bu Site	ıild - River Center
Base ICTF				
		Pes.(N)	☐ Plar	nning Data
3795	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 7	
	veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi	
tments		·		
		E <sub>D</sub>	1.2	
		• •		
1.0				
	ft	Calc Speed Auj and	13	
2	IL	1		mph
3	ramna/mi			mph
60.0	•	1		mph
60.0	mpn	FFS	60.0	mph
	mph			
e Measures	<u> </u>	Design (N)		
		Design (N)		
N x f <sub>HV</sub> 1455	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	pc/h/ln
60.0	mph	·		
24.3	pc/mi/ln			mph
С		· '	s, N	pc/mi/ln
		<u> </u>	,	
S - Spee	d			f F.J. 9. 9. 44. 5
		1 13	44.40	f <sub>LW</sub> - Exhibit 11-8
	-	1 '	11-13	f <sub>LC</sub> - Exhibit 11-9
		l r	44.6	TRD - Page 11-11
hour volume		LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-2,	
	AJR Atkins 7/25/2014 AM Peak Base ICTF  3795  tments 1.00 1.5  3 60.0  e Measures  N x f <sub>HV</sub> 1455 60.0 24.3 C S - Spee D - Dens FFS - Free	AJR Atkins 7/25/2014 AM Peak Base ICTF  3795 veh/h veh/day  veh/h  tments 1.00 1.5  ft ft ft 3 ramps/mi 60.0 mph mph e Measures  N x f <sub>HV</sub> 1455 pc/h/ln 60.0 mph 24.3 pc/mi/ln C  S - Speed D - Density FFS - Free-flow speed BFFS - Base free-flow	Site Information	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed Analysis Time Period	AJR Atkins 7/25/2014 PM Peak		Highway/Direction of Trave From/To Jurisdiction Analysis Year	2165-De Dorches	orches Off to
Project Description Navy	Base ICTF			Sile	
✓ Oper.(LOS)			Des.(N)	☐ Plar	nning Data
Flow Inputs					
Volume, V AADT Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D	5069	veh/h veh/day veh/h	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub> %RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0.90 6 0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub> E <sub>T</sub>	1.00 1.5		$E_R$ $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1.2 1)] 0.971	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance Number of Lanes, N	3	ft	f <sub>LW</sub>		mph
Total Ramp Density, TRD	3	ramps/mi	f <sub>LC</sub> TRD Adjustment		mph mph
FFS (measured) Base free-flow Speed, BFFS	60.0	mph mph	FFS	60.0	mph
LOS and Performanc	e Measures	<b>3</b>	Design (N)		
Operational (LOS)  v <sub>p</sub> = (V or DDHV) / (PHF x   x f <sub>p</sub> ) S D = v <sub>p</sub> / S LOS	N x f <sub>HV</sub> 1934 58.0 33.4 D	pc/h/ln mph pc/mi/ln	Design (N) Design LOS $v_p = (V \text{ or DDHV}) / (PHF \text{ x} \text{ x } f_p)$ S $D = v_p / S$ Required Number of Lanes		pc/h/ln mph pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed DDHV - Directional design	BFFS - Ba		$E_R$ - Exhibits 11-10, 11-12 $E_T$ - Exhibits 11-10, 11-11, $f_p$ - Page 11-18 LOS, S, FFS, $v_p$ - Exhibits 11-3	11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1

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		RAI	MPS AND	RAMP JUN	CTIONS W	ORKSH	EET			
General	Infor				Site Infor					
Analyst		AJR		Fr	eeway/Dir of Tr		I-26 WB			
Agency or C	, ,	Atkin	S	Ju	ınction		2170 - WB Or	n from Dorchester		
Date Perform		7/25/			ırisdiction					
Analysis Tin				Aı	nalysis Year		2038 Build - F	River Center Site		
	cription	Navy Base ICT	F							
nputs			1						1	
Jpstream A	dj Ramp		Freeway Num	ber of Lanes, N	3				Downstre	eam Adj
			Ramp Numbe	r of Lanes, N	1				Ramp	
Yes	On		Acceleration L	ane Length, L <sub>A</sub>	600				□Yes	On
✓ No	Off		Deceleration L	ane Length L <sub>D</sub>						
			Freeway Volu	me, V <sub>E</sub>	3795				☑ No	Off
up =	ft		Ramp Volume		268				L <sub>down</sub> =	ft
			1	Flow Speed, S <sub>FF</sub>	60.0					
/ <sub>u</sub> =	veh/h		1	ow Speed, S <sub>FR</sub>	45.0				$V_D =$	veh/h
2	-: 4-	//- 11		111	43.0					
onver	sion to	y pc/n Und V	der Base (	Conditions		Ī	1	1	1	
(pc/l	n)	v (Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	f <sub>p</sub>	v = V/PH	$IF  x  f_{HV}  x  f_{p}$
Freeway		3795	0.90	Level	7	0	0.966	1.00	1	4364
Ramp		268	0.90	Level	22	0	0.901	1.00	1	331
JpStream								- 1100		
DownStrea	m									
			Merge Areas					Diverge Areas		
Estimat	ion of	v <sub>12</sub>				Estimat	ion of v <sub>12</sub>	?		
		V <sub>12</sub> = V <sub>F</sub>	( P <sub>EM</sub> )				\/	- \/ + (\/ \/	\D	
<sub>EQ</sub> =			` ™′ ation 13-6 or	13-7)			V 12	$_{2} = V_{R} + (V_{F} - V_{I})$		40)
				ion (Exhibit 13-6)		L <sub>EQ</sub> =		(Equation 13		
o <sub>FM</sub> = v <sub>12</sub> =		2594		IOTT (EXTIIDIT 13-0)		P <sub>FD</sub> =		using Equation	on (Exhibit	13-7)
				on 13-14 or 13-		V <sub>12</sub> =		pc/h		
$V_3$ or $V_{av34}$		1770	pc/ii (Equalic	)   13-14 0  13-		V <sub>3</sub> or V <sub>av34</sub>		pc/h (Equation		-17)
s V <sub>3</sub> or V <sub>av</sub>	34 > 2,700	0 pc/h?	s 🗸 No			Is V <sub>3</sub> or V <sub>av</sub>	<sub>34</sub> > 2,700 pc/l	n? □Yes □No	)	
		V <sub>12</sub> /2 ☐ Ye				Is V <sub>3</sub> or V <sub>av</sub>	<sub>34</sub> > 1.5 * V <sub>12</sub> /2	<sup>2</sup> □Yes □No	)	
				3-16, 13-18, or		If Yes,V <sub>12a</sub> =		pc/h (Equation	on 13-16, 1	13-18, or
Yes,V <sub>12a</sub> =		13-19)				12a		13-19)		
Capacit	y Che	cks				Capacit	y Checks			
		Actual	С	apacity	LOS F?		Act	ual Ca	apacity	LOS F?
						$V_{F}$		Exhibit 13	3-8	
V <sub>F</sub>		4695	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>	Exhibit 13	3-8	
- F(	,	1000	Extribit 10 0					Exhibit 13	3-	
						V <sub>R</sub>		10		
low Er	tering	Merge In	fluence A			Flow En	tering Di	verge Influe		
		Actual	Max	Desirable	Violation?		Actual	Max Des	sirable	Violation?
$V_{R1}$	2	2925	Exhibit 13-8	4600:AII	No	V <sub>12</sub>		Exhibit 13-8		
evel of	f Servi	ice Detern	nination (i	f not F)		Level of	Service	Determination	on (if no	t F)
D <sub>R</sub> =	5.475 +	0.00734 v <sub>R</sub> + 0	0.0078 V <sub>12</sub> - 0.0	00627 L <sub>A</sub>			D <sub>R</sub> = 4.252	+ 0.0086 V <sub>12</sub> - 0	0.009 L <sub>D</sub>	
<sub>R</sub> = 24	4.4 (pc/mi	i/ln)				D <sub>R</sub> = (p	oc/mi/ln)		_	
	(Exhibit					1	Exhibit 13-2	)		
	,	nination				`	Determina			
_						<b>-</b>		itiOII		
•	.340 (Exib					,	Exhibit 13-12)	40)		
$S_R = 53$	3.9 mph (	Exhibit 13-11)				l ''	ph (Exhibit 13			
i <sub>0</sub> = 55	5.4 mph (	Exhibit 13-11)				$S_0 = m$	ph (Exhibit 13	-12)		
	4.5 mph (	Exhibit 13-13)				S = m	ph (Exhibit 13	-13)		
		:44 Fl: AII	Rights Reserve	٠		LIGODO44T	M Version 6.41		Congrated	: 12/9/2014 2:

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		WIPS AND	RAMP JUN			:= 1			
General Infor	mation			Site Infor	mation				
Analyst	AJR		Fr	eeway/Dir of Tr	avel I	I-26 WB			
gency or Company	Atkin	S		nction	2	2170 - WB On f	rom Dorchester		
ate Performed	7/25/			risdiction					
Analysis Time Period			Ar	nalysis Year		2038 Build - Riv	er Center Site		
Project Description	Navy Base IC	<u>r</u>							
nputs									
Jpstream Adj Ramp		Freeway Num	ber of Lanes, N	3				Downstre	am Adj
		Ramp Numbe	r of Lanes, N	1				Ramp	-
Yes On	l	Acceleration L	ane Length, L	600				□Yes	On
ZINa DOS		Deceleration L	ane Length L <sub>D</sub>						
☑ No ☐ Off		Freeway Volui	- 5	5069				☑ No	Off
<sub>up</sub> = ft		Ramp Volume		591				L <sub>down</sub> =	ft
up		1	**						
/ <sub>u</sub> = veh/h		1	-Flow Speed, S <sub>FF</sub>	60.0				$V_D =$	veh/h
			ow Speed, S <sub>FR</sub>	45.0					
Conversion to		der Base (	Conditions	1	1	1		1	
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f <sub>HV</sub>	fp	v = V/PHI	F x f <sub>HV</sub> x f <sub>p</sub>
Freeway	(Ven/nr) 5069	0.90	Level	6	0	0.971	1.00		5801
Ramp	5009	0.90	Level	9	0	0.971	1.00		686
JpStream	291	0.90	Level	9	U	0.957	1.00	+	000
DownStream							1	<del>                                     </del>	
		Merge Areas					Diverge Areas		
stimation of					Estimati	on of V <sub>12</sub>	<u> </u>		
	V <sub>12</sub> = V <sub>F</sub>	/ D \							
_			40.7)			V <sub>12</sub> =	$= V_R + (V_F - V_F)$	<sub>R</sub> )P <sub>FD</sub>	
EQ =		ation 13-6 or			L <sub>EQ</sub> =		(Equation 13	-12 or 13-1	13)
P <sub>FM</sub> =			ion (Exhibit 13-6)		P <sub>FD</sub> =		using Equation	on (Exhibit 1	3-7)
/ <sub>12</sub> =	3448				V <sub>12</sub> =		pc/h		
/ <sub>3</sub> or V <sub>av34</sub>		pc/h (Equation	on 13-14 or 13-		V <sub>3</sub> or V <sub>av34</sub>		pc/h (Equation	13-14 or 13-	17)
	17)					. > 2.700 pc/h?	Yes No		,
$V_3 \text{ or } V_{av34} > 2,70$						•	☐Yes ☐No		
ls V <sub>3</sub> or V <sub>av34</sub> > 1.5 *							pc/h (Equation		3-18 or
Yes,V <sub>12a</sub> =	pc/h 13-19)		3-16, 13-18, or		If Yes,V <sub>12a</sub> =		13-19)	)II 13-10, I	J- 10, OI
Capacity Che					Canacity	/ Checks			
supacity one	Actual		apacity	LOS F?	Capacity	Actua	ol Ca	pacity	LOS F?
	Actual	<del>l ĭ</del>	араску	LOGTE	V <sub>F</sub>	Actue	Exhibit 13-	· - ·	LOGIE
					-			_	_
$V_{FO}$	6487	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V <sub>R</sub>	Exhibit 13-		
. •					$V_R$		Exhibit 13	3-	
. •				1			1 10		
		fluoro A				toring Dire			
		1		Violation?		1	erge Influei		
Flow Entering	Actual	Max	Desirable	Violation?	Flow En	tering Dive	erge Influer Max Des		Violation?
Flow Entering V <sub>R12</sub>	Actual 4134	Max Exhibit 13-8	Desirable 4600:All	Violation?	Flow En	Actual	erge Influer  Max Des  Exhibit 13-8	sirable	Violation
V <sub>R12</sub> Level of Serv	Actual 4134 ice Deterr	Max Exhibit 13-8	Desirable 4600:All if not F)	1	Flow En	Actual Service D	Max Des Exhibit 13-8	sirable on (if not	Violation
V <sub>R12</sub> .evel of Serv	Actual 4134 ice Detern 0.00734 v <sub>R</sub> + (	Max Exhibit 13-8	Desirable 4600:All if not F)	1	Flow Ent	Actual  Service D  OR = 4.252 +	erge Influer  Max Des  Exhibit 13-8	sirable on (if not	Violation
V <sub>R12</sub> Level of Serv D <sub>R</sub> = 5.475 +	Actual 4134 ice Detern 0.00734 v <sub>R</sub> + (	Max Exhibit 13-8	Desirable 4600:All if not F)	1	Flow Ent	Actual Service D	Max Des Exhibit 13-8	sirable on (if not	Violation
Flow Entering $V_{R12}$ Evel of Serv $D_{R} = 5.475 + 0$ $D_{R} = 33.6 \text{ (pc/m}$	Actual 4134 <b>ice Detern</b> 0.00734 v <sub>R</sub> + ( i/ln)	Max Exhibit 13-8	Desirable 4600:All if not F)	1	Flow Ent	Actual  Service D  OR = 4.252 +	Max Des Exhibit 13-8	sirable on (if not	Violation
Flow Entering $V_{R12}$ Level of Serv. $D_R = 5.475 + 33.6 \text{ (pc/m}$ OS = D (Exhibit	Actual 4134 ice Detern 0.00734 v <sub>R</sub> + ( i/ln) 13-2)	Max Exhibit 13-8	Desirable 4600:All if not F)	1	Flow Ent	Actual  Service D  O <sub>R</sub> = 4.252 + c/mi/ln)	Max Des Exhibit 13-8 etermination 0.0086 V <sub>12</sub> - 0	sirable on (if not	Violation
Flow Entering $V_{R12}$ Level of Serve $D_R = 5.475 + 0.0$ $D_R = 33.6 \text{ (pc/m}$ $D_R = 0.0 \text{ (Exhibit)}$ Speed Determ	Actual 4134 ice Detern 0.00734 v <sub>R</sub> + ( i/ln) 13-2)	Max Exhibit 13-8	Desirable 4600:All if not F)	1	Flow End  V <sub>12</sub> Level of  D <sub>R</sub> = (policy level of level	Actual  Service D  OR = 4.252 + c/mi/ln)  xhibit 13-2)  Determinat	Max Des Exhibit 13-8 etermination 0.0086 V <sub>12</sub> - 0	sirable on (if not	Violation
Flow Entering $V_{R12}$ Level of Serv. $D_R = 5.475 + 0.0$ $D_R = 33.6 \text{ (pc/m}$ $D_R = 0.510 \text{ (Exilative Speed Detern}$	Actual 4134  ice Detern 0.00734 v <sub>R</sub> + 0 i/ln) 13-2) inination  bit 13-11)	Max Exhibit 13-8	Desirable 4600:All if not F)	1	V <sub>12</sub>   Level of   D <sub>R</sub> = (po   LOS = (E   Speed D   D <sub>S</sub> = (E)	Actual  Service D  OR = 4.252 + c/mi/ln)  xhibit 13-2)  Determinat  xhibit 13-12)	erge Influer  Max Des  Exhibit 13-8  eterminatio  0.0086 V <sub>12</sub> - 0	sirable on (if not	Violation
Flow Entering $V_{R12}$ Level of Serv. $D_R = 5.475 + 0.00$ $D_R = 0.475 + 0.00$ $D_R = 0.$	Actual 4134  ice Determ 0.00734 v <sub>R</sub> + ( i/ln) 13-2)  nination  bit 13-11)  Exhibit 13-11)	Max Exhibit 13-8	Desirable 4600:All if not F)	1	Flow Entropy Control of the Control	Actual  Service D  O <sub>R</sub> = 4.252 + c/mi/ln)  xhibit 13-2)  eterminat.  xhibit 13-12)  ch (Exhibit 13-12)	erge Influer  Max Des Exhibit 13-8 Petermination  ion	sirable on (if not	Violation
Flow Entering $V_{R12}$ Level of Servi $D_R = 5.475 + 0.0$ $D_R = 33.6$ (pc/m $D_R = 0.540$ (Exhibit)  Speed Determ $M_S = 0.510$ (Exilogent Services)	Actual 4134  ice Detern 0.00734 v <sub>R</sub> + 0 i/ln) 13-2) inination  bit 13-11)	Max Exhibit 13-8	Desirable 4600:All if not F)	1	V <sub>12</sub>   Level of   C   C   C   C   C   C   C   C   C	Actual  Service D  OR = 4.252 + c/mi/ln)  xhibit 13-2)  Determinat  xhibit 13-12)	erge Influer  Max Des Exhibit 13-8  etermination  0.0086 V <sub>12</sub> - 0  ion	sirable on (if not	Violation?

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	2180 - E Montagi	Porchester to
Date Performed	7/25/2014		Jurisdiction	Workage	16
Analysis Time Period	AM Peak		Analysis Year	2038 Bu Site	iild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	☐ Plar	ning Data
Flow Inputs					
Volume, V AADT	4063	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 7	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length	Level mi	
			Up/Down %		
Calculate Flow Adjus	tments				
$f_p$	1.00		$E_R$	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] 0.966	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	3		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performanc	e Measures	3	Design (N)		
			Design (N)		
Operational (LOS)	N £		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x I)$	1557 HV	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	n o /lo /l n
x f <sub>p</sub> )	60.0	mnh	$x f_p$ )		pc/h/ln
S	60.0	mph	s		mph
$D = v_p / S$	26.0 C	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	C		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed	F - Evhibite 11 10 11 12		f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens		$E_R$ - Exhibits 11-10, 11-12 $E_T$ - Exhibits 11-10, 11-11,		
v <sub>p</sub> - Flow rate		e-flow speed	1 '	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		se free-flow	f <sub>p</sub> - Page 11-18	11 2	TRD - Page 11-11
speed	haural		LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-∠,	
DDHV - Directional design	nour volume				

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>I-26 WB</i>	}
Agency or Company	Atkins		From/To		Porchester to
Date Performed	7/25/2014		Jurisdiction	Montagi	ue
Analysis Time Period	PM Peak		Analysis Year	2038 Bu Site	ıild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			es.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	5660	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 6	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0 Level mi	
Calculate Flow Adjus	tmonts		Ор/Домп //		
	1.00			1.2	
f <sub>p</sub>			E <sub>R</sub>		
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$		
Speed Inputs			Calc Speed Adj and I	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance	_	ft	$f_{LW}$		mph
Number of Lanes, N	3		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performanc	e Measures	<b>3</b>	Design (N)		
0 ( 1/100)			Design (N)		
Operational (LOS)	NI £		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x)$	N X I <sub>HV</sub> 2159	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	
$x f_p$	54.0		$x^{r}f_{p}$ )		pc/h/ln
S D = · · · / C	54.3	mph	s		mph
$D = v_p / S$	39.7	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	Ε		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed			f Eubihit 44.0
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12	11 12	f <sub>LW</sub> - Exhibit 11-8
v <sub>p</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		se free-flow	f <sub>p</sub> - Page 11-18	11.0	TRD - Page 11-11
speed	la accine de la		LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-∠,	
DDHV - Directional design	nour volume		1-0		

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Seneral Information			RAMP	S AND RAM	IP JUNCTI	ONS WOF	RKSH	IEET			
Quanty of Company   Attins   Junction   2190-WB Off to Montague   Interview   1298   In	General Info	rmation									
	Analyst	AJR		F			-26 WB				
Available   Ava		y Atkin	S			2	190-WE	3 Off to Mon	tague		
Downstream Adj Ramp	Date Performed										
Downstream Adj   Ramp				A	nalysis Year	2	.038 Bu	ild - River C	enter Site		
Upstream Adj Ramp		Navy Base ICT	F								
Pamp Number of Lanes, N	inputs										
Yes   On	Upstream Adj	Ramp	1								m Adj
Pose   Conversion to pc/h   Deceleration Lane Length L <sub>0</sub>   240   Freeway Presel ength L <sub>0</sub>   4063   Ramp Volume, V <sub>g</sub>   1141   V <sub>0</sub> = veh/h   Freeway Free-Flow Speed, S <sub>FR</sub>   45.0   V <sub>0</sub> = veh/h   V	□Ves	On	l '	·-	1					Ramp	
Freeway Volume, V <sub>F</sub>   4063				,,						☐Yes	On
Treeway volume, V <sub>F</sub>   4063   V <sub>D</sub>   veh/h   Ramp Volume, V <sub>R</sub>   11411   V <sub>D</sub>   veh/h   Ramp Volume, V <sub>R</sub>   11411   V <sub>D</sub>   veh/h   Ramp Free-Flow Speed, S <sub>FR</sub>   45.0   V <sub>D</sub>   veh/h   v	✓ No	Off	1							✓ No	Off
Value   Val			Freeway Volu	me, V <sub>F</sub>	4063				1		
Variable	L <sub>up</sub> =	ft	Ramp Volume	e, V <sub>R</sub>	1141				l l	-down =	π
Ramp Free-Flow Speed, S <sub>FR</sub>   45,0	\/ -	1- //-	Freeway Free	-Flow Speed, S <sub>FF</sub>	60.0					/ =	veh/h
(pch)	v <sub>u</sub> =	ven/n	Ramp Free-Fl	ow Speed, S <sub>FR</sub>	45.0					<b>v</b> D _	VCII/II
(Veh/hr)   PHF   Terrain   Vehruk	Conversion	<del></del>	der Base	Conditions							
Ramp	(pc/h)		PHF	Terrain	%Truck	%Rv	f	HV	f <sub>p</sub>	/ = V/PHF	$x f_{HV} x f_{p}$
Description	Freeway	7	0	0.9	66	1.00	467	<b>'</b> 2			
DownStream   Merge Areas   Diverge Areas   Diverge Areas	Ramp	11	0	0.9	48	1.00	133	38			
Merge Areas   Estimation of V12   Estimation of V12   V12 = VR + (VF - VR)PFD	UpStream										
Stimation of v <sub>12</sub>	DownStream										
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Cating ation a		Merge Areas			Fatimati	4		erge Areas		
Equation 13-6 or 13-7	Estimation of	or v <sub>12</sub>				Estimation	on or	V <sub>12</sub>			
Using Equation (Exhibit 13-6)		$V_{12} = V_{F}$	( P <sub>FM</sub> )					$V_{12} = V$	' <sub>R</sub> + (V <sub>F</sub> - V <sub>R</sub>	)P <sub>FD</sub>	
Second Processisted   Processiste	L <sub>EQ</sub> =	(Equa	tion 13-6 or	13-7)		L <sub>EQ</sub> =		(Ec	uation 13-12	2 or 13-13)	
Solution	P <sub>FM</sub> =	using	Equation (	Exhibit 13-6)				0.58	2 using Equ	ation (Exhib	oit 13-7)
Solution	V <sub>12</sub> =	pc/h						3277	pc/h		
S V <sub>3</sub> or V <sub>av34</sub> > 2,700 pc/h?   Yes   No   Is V <sub>3</sub> or V <sub>av34</sub> > 2,700 pc/h?   Yes   No   Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 *V <sub>12</sub> /2   Yes   No   Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 *V <sub>12</sub> /2   Yes   No   Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 *V <sub>12</sub> /2   Yes   No   Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 *V <sub>12</sub> /2   Yes   No   Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 *V <sub>12</sub> /2   Yes   No   Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 *V <sub>12</sub> /2   Yes   No   Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 *V <sub>12</sub> /2   Yes   No   Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 *V <sub>12</sub> /2   Yes   No   Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 *V <sub>12</sub> /2   Yes   No   Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 *V <sub>12</sub> /2   Yes   No   Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 *V <sub>12</sub> /2   Yes   No   Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 *V <sub>12</sub> /2   Yes   No   Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 *V <sub>12</sub> /2   Yes   No   Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 *V <sub>12</sub> /2   Yes   No   Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 *V <sub>12</sub> /2   Yes   No   No   No   No   No   No   No   N	V <sub>3</sub> or V <sub>av34</sub>	pc/h (	Equation 13	-14 or 13-17)		V <sub>3</sub> or V <sub>3V34</sub>		1395	pc/h (Egua	ntion 13-14	or 13-17)
S							> 2,70				ŕ
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	0 0,0,										
Actual   Capacity   LOS F?   Actual   Capacity   LOS F?   Actual   Capacity   LOS F?   V <sub>F</sub>   4672   Exhibit 13-8   6900   No   V <sub>FO</sub>   V <sub>F</sub>   1338   Exhibit 13-8   6900   No   V <sub>FO</sub>   V <sub>F</sub>   1338   Exhibit 13-10   2100   No   V <sub>R</sub>   1338   Exhibit 13-8   4400;All   No   V <sub>R</sub>   23277   Exhibit 13-8   23277   Exhibit 13-8   23277   Exhibit 13-8   23277   23277   Exhibit 13-8   23277				-16, 13-18, or						13-16, 13-	18, or 13-
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		13-19)				1-0		19)	\		
$ V_{FO} = V_F - V_R = 3334 = \text{Exhibit } 13-8 = 6900 = \text{No} $ $ V_{FO} = V_F - V_R = 3334 = \text{Exhibit } 13-8 = 6900 = \text{No} $ $ V_R = 1338 = \text{Exhibit } 13-8 = 6900 = \text{No} $ $ V_R = 1338 = \text{Exhibit } 13-10 = 2100 = \text{No} $ $ V_R = 1338 = \text{Exhibit } 13-10 = 2100 = \text{No} $ $ V_R = 1338 = \text{Exhibit } 13-10 = 2100 = \text{No} $ $ V_R = 1338 = \text{Exhibit } 13-10 = E$	Capacity Ch	ecks				Capacity	Che	cks			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		Actual	C	apacity	LOS F?			Actual		acity	LOS F?
V <sub>R</sub>   1338   Exhibit 13-10   2100   No						$V_{F}$		4672	Exhibit 13-8	6900	No
Flow Entering Merge Influence Area   Retual   Max Desirable   Violation?   Actual   Max Desirable   Violation?   Actual   Max Desirable   Violation?   V12   3277   Exhibit 13-8   4400:All   No	$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$	- V <sub>R</sub>	3334	Exhibit 13-8	6900	No
Flow Entering Merge Influence Area   Actual   Max Desirable   Violation?   Actual   Max Desirable   Violation?   Actual   Max Desirable   Violation?   Actual   Max Desirable   Violation?   V12   3277   Exhibit 13-8   4400:All   No						$V_R$		1338	Exhibit 13-10	2100	No
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Flow Enterin	na Merae In	fluence A	rea		+	ering	n Divera	e Influenc	e Area	
Level of Service Determination (if not F)         Level of Service Determination (if not F) $D_R = 5.475 + 0.00734 \text{ v}_R + 0.0078 \text{ V}_{12} - 0.00627 \text{ L}_A$ $D_R = 4.252 + 0.0086 \text{ V}_{12} - 0.009 \text{ L}_D$ $D_R = (\text{pc/mi/ln})$ $D_R = 30.3 \text{ (pc/mi/ln})$ $D_R = (\text{Exhibit 13-2})$ $D_R = 30.3 \text{ (pc/mi/ln})$ $D_R = (\text{Exhibit 13-2})$ $D_R = 30.3 \text{ (pc/mi/ln})$ $D_R = (\text{Exhibit 13-2})$ $D_R = (\text{Exhibit 13-2})$ $D_R = (\text{Exhibit 13-11})$ $D_R = (\text{Exhibit 13-12})$ $D_R = (\text{Exhibit 13-13})$ $D_R = (\text{Exhibit 13-13})$					Violation?	1011 =111					Violation?
Level of Service Determination (if not F)         Level of Service Determination (if not F) $D_R = 5.475 + 0.00734 \text{ v}_R + 0.0078 \text{ V}_{12} - 0.00627 \text{ L}_A$ $D_R = 4.252 + 0.0086 \text{ V}_{12} - 0.009 \text{ L}_D$ $D_R = (\text{pc/mi/ln})$ $D_R = 30.3 \text{ (pc/mi/ln})$ $D_R = (\text{Exhibit 13-2})$ $D_R = 30.3 \text{ (pc/mi/ln})$ $D_R = (\text{Exhibit 13-2})$ $D_R = 30.3 \text{ (pc/mi/ln})$ $D_R = (\text{Exhibit 13-2})$ $D_R = (\text{Exhibit 13-2})$ $D_R = (\text{Exhibit 13-11})$ $D_R = (\text{Exhibit 13-12})$ $D_R = (\text{Exhibit 13-13})$ $D_R = (\text{Exhibit 13-13})$	V <sub>R12</sub>		Exhibit 13-8			V <sub>12</sub>					
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		vice Detern		if not F)	-		Serv	ice Dete	rmination	(if not F	<del>-</del> )
$\begin{array}{llllllllllllllllllllllllllllllllllll$										•	•
$ \begin{array}{llllllllllllllllllllllllllllllllllll$		**	12	Α		1			14	D	
Speed DeterminationSpeed Determination $M_S =$ (Exibit 13-11) $D_S =$ 0.418 (Exhibit 13-12) $S_R =$ mph (Exhibit 13-11) $S_R =$ 52.5 mph (Exhibit 13-12) $S_0 =$ mph (Exhibit 13-11) $S_0 =$ 64.3 mph (Exhibit 13-12) $S_0 =$ mph (Exhibit 13-13) $S_0 =$ 55.5 mph (Exhibit 13-13)		•				1		,			
$M_{\rm S} = \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $	,	· · · · · · · · · · · · · · · · · · ·				,			<u> </u>		
$S_R^{=}$ mph (Exhibit 13-11) $S_R^{=}$ 52.5 mph (Exhibit 13-12) $S_0^{=}$ mph (Exhibit 13-11) $S_0^{=}$ 64.3 mph (Exhibit 13-12) $S_0^{=}$ 65.5 mph (Exhibit 13-13) $S_0^{=}$ 55.5 mph (Exhibit 13-13)						<del>                                     </del>					
$S_0$ = mph (Exhibit 13-11) $S_0$ = 64.3 mph (Exhibit 13-12) $S_0$ = 55.5 mph (Exhibit 13-13)		•					-				
S = mph (Exhibit 13-13) S = 55.5 mph (Exhibit 13-13)		•					-		-		
		,				1 '	-		-		
			VII District								0044 004=

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General In	formation	1 AMIL V	S AND RAM	Site Infor						
Analyst	AJR		E,	reeway/Dir of Tr		I-26 WE				
Agency or Comp				unction			o VB Off to M	lontague		
ate Performed	•	/2014		urisdiction		Z 130-V	VD OII (O IVI	onlague		
nalysis Time Pe		Peak		nalysis Year		2038 B	uild - River	Center Site		
	on Navy Base IC		7 11	naryoro roar		2000 D	uliu Trivoi	OCHICI OILO		
nputs										
Upstream A	ıdi Ramp	Freeway Num	per of Lanes, N	3					Downstre	am Adi
	_	Ramp Number	of Lanes, N	1					Ramp	anninaj
□Yes	☐ On	Acceleration L	ane Length, L <sub>A</sub>						□Yes	On
✓ No	Off	Deceleration L	ane Length L <sub>D</sub>	240					✓ No	Off
		Freeway Volui	ne, V <sub>F</sub>	5660						
L <sub>up</sub> =	ft	Ramp Volume		1156					L <sub>down</sub> =	ft
V,, =	veh/h		Flow Speed, $S_{FF}$	60.0					V <sub>D</sub> =	veh/h
<b>*</b> u	VCIIII	Ramp Free-Flo	ow Speed, S <sub>FR</sub>	45.0					D	
Conversio	n to pc/h Un	der Base (	Conditions							
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	f <sub>p</sub>	v = V/PHF	x f <sub>HV</sub> x f <sub>p</sub>
reeway	5660	0.90	Level	6	0	0.	971	1.00	6	478
Ramp	1156	0.90	Level	9	0	_	957	1.00	1	342
JpStream										
DownStream										
		Merge Areas						Diverge Areas		
stimation	of v <sub>12</sub>				Estimat	ion o	f v <sub>12</sub>			
	V <sub>12</sub> = V <sub>F</sub>	( P <sub>FM</sub> )					V <sub>12</sub> =	V <sub>R</sub> + (V <sub>F</sub> - V <sub>F</sub>	P <sub>FD</sub>	
EQ =	(Equ	ation 13-6 or	13-7)		L <sub>EQ</sub> =		(	Equation 13-1	2 or 13-1	3)
- = FM =	usino	Equation (E	xhibit 13-6)		P <sub>FD</sub> =		0.	536 using Equ	uation (Exh	ibit 13-7)
12 =	pc/h		•		V <sub>12</sub> =			)97 pc/h	,	,
or V <sub>av34</sub>	•	(Equation 13-	14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>			881 pc/h (Equa	ation 13-1	4 or 13-17
	2,700 pc/h? ☐ Ye		110110111			> 2 7		Yes ☑ No	30011 10 1	101 10 17
	1.5 * V <sub>12</sub> /2							Yes ✓ No		
0 0,01			-16, 13-18, or		"	• .		oc/h (Equation	13_16 13	-18 or 13
Yes,V <sub>12a</sub> =	13-19	: •	10, 10 10, 01		If Yes,V <sub>12a</sub> =	=		9)	10 10, 10	7 10, 01 10
Capacity C	Checks				Capacit	y Ch	ecks			
	Actual	С	apacity	LOS F?			Actual	Ca	pacity	LOS F
					V <sub>F</sub>		6478	Exhibit 13-8	6900	No
$V_{FO}$		Exhibit 13-8			V <sub>FO</sub> = V <sub>F</sub>	- V <sub>R</sub>	5136	Exhibit 13-8	6900	No
					V <sub>R</sub>		1342	Exhibit 13-1	2100	No
low Entor	ring Merge II	afluonco A	ro2			torin		rge Influen		1
TOW LINE	Actual		Desirable	Violation?	I TOW LI	_	Actual	Max Desirab		Violation
V <sub>R12</sub>	7100001	Exhibit 13-8	300114010	Violation:	V <sub>12</sub>	$\neg$	1097	Exhibit 13-8	4400:All	No
	ervice Deteri		f not E)		<del></del>			termination		
									_	Γ)
	+ 0.00734 v <sub>R</sub> +	0.0076 V <sub>12</sub> -	0.00627 L <sub>A</sub>		1			.0086 V <sub>12</sub> - 0.0	009 L <sub>D</sub>	
$l_R = (pc/m)$					l ''	7.3 (pc/	,			
`	ibit 13-2)					`	oit 13-2)			
Speed Det	ermination				Speed L					
	oit 13-11)				1	419 (E	xhibit 13-	-12)		
$I_S = (Exib)$	E 1 11 11 40 44\				$S_R = 52$	2.5 mph	(Exhibit	13-12)		
	Exhibit 13-11)				"					
<sub>R</sub> = mph (	Exhibit 13-11)  Exhibit 13-11)				1	0.4 mph	(Exhibit	13-12)		
$t_{R} = mph (l)$	•				S <sub>0</sub> = 60		(Exhibit (Exhibit	*		

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	T	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>I-26 WE</i>	}
Agency or Company	Atkins		From/To	2195-M	ontagu Off to
Date Performed	7/25/2014		Jurisdiction	Montag	u On
Analysis Time Period	AM Peak		Analysis Year	2038 Βι Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	☐ Plar	nning Data
Flow Inputs					
Volume, V	2922	veh/h	Peak-Hour Factor, PHF	0.90	
AADT		veh/day	%Trucks and Buses, $P_T$	8	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length	Level mi	
DDHV - AADIXKXD		ven/m	Grade % Length Up/Down %	IIII	
Calculate Flow Adjus	tments				
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$		
Speed Inputs	7.0		Calc Speed Adj and		
Lane Width		ft	Caic Speed Adj alid	113	
		ft			
Rt-Side Lat. Clearance	2	П	f <sub>LW</sub>		mph
Number of Lanes, N	3	, .	f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performanc	e Measures	<u> </u>	Design (N)		
			Design (N)		
Operational (LOS)			Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub> 1126	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f	
x f <sub>p</sub> )	7.20	p 6/1////	$x f_p$	HV	pc/h/ln
S	60.0	mph	S S		mph
$D = v_p / S$	18.8	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	С		Required Number of Lanes	s N	ролили
Glossary			Factor Location	J, 14	
N - Number of lanes	S - Spee				
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
· ·		•	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate LOS - Level of service		e-flow speed ase free-flow	f <sub>p</sub> - Page 11-18		TRD - Page 11-11
speed	סם - ט ו ום	AGG II GG-II GVV	LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	
DDHV - Directional design	hour volume		11-3		
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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	T	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	el <i>I-26 WB</i>	}
Agency or Company	Atkins		From/To	2195-M	ontagu Off to
Date Performed	7/25/2014		Jurisdiction	Montagi	u On
Analysis Time Period	PM Peak		Analysis Year	2038 Βι Site	ıild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plar	nning Data
Flow Inputs					
Volume, V	4504	veh/h	Peak-Hour Factor, PHF	0.90	
AADT		veh/day	%Trucks and Buses, $P_T$	6	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		a la /la	General Terrain:	Level	
DDHV = AADTXKXD		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments		<b>Ор/Вомн 70</b>		
	1.00		E <sub>R</sub>	1.2	
f <sub>p</sub> □	1.5				
E <sub>T</sub>	1.0		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$		
Speed Inputs			Calc Speed Adj and	FF5	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	3		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performanc	e Measures	<u> </u>	Design (N)		
	- modeouro		Design (N)		
Operational (LOS)			Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV 1710</sub>	pc/h/ln	$v_n = (V \text{ or DDHV}) / (PHF x)$	Nyf	
x f <sub>p</sub> )	1710	рс/п/п	P	'N A I <sub>HV</sub>	pc/h/ln
s	59.7	mph	x f <sub>p</sub> )		ma m la
$D = v_p / S$	28.8	pc/mi/ln	5		mph
LOS	D		$D = v_p / S$	- NI	pc/mi/ln
			Required Number of Lanes	5, IN	
Glossary			Factor Location		
N - Number of lanes	S - Spee		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
V - Hourly volume	D - Dens	•	E <sub>T</sub> - Exhibits 11-10, 11-11,		f <sub>LC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate		e-flow speed	f <sub>n</sub> - Page 11-18		TRD - Page 11-11
LOS - Level of service speed	BFFS - Ba	ase free-flow	LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	<b>9</b>
DDHV - Directional design	hour volume		11-3	,	
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Navy Base ICTF

			REEWAY	WEAV			T		
General	Information	on			Site Info	rmation			
Analyst Agency/Com Date Perforr Analysis Tim	ned ne Period	AJR Atkins 7/25/20 AM Pea			Freeway/Dir Weaving Seg Analysis Yea	gment Location		/B - Montague to Build - River	
Project Desc <b>Inputs</b>	cription Navy Ba	ase ICTF							
Weaving cor Weaving nu Weaving seg	nfiguration mber of lanes, N gment length, L <sub>s</sub> e-flow speed, FF	3		One-Sided 4 1920ft 60 mph	Segment typ Freeway min Freeway max Terrain type	imum speed			Freewa 1 230 Leve
Convers	sions to po	/h Unde	r Base Co	ndition	S				
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	$f_{HV}$	fp	v (pc/h)
$V_{FF}$	2490	0.90	8	0	1.5	1.2	0.962	1.00	2877
$V_{RF}$	389	0.90	25	0	1.5	1.2	0.889	1.00	486
$V_{FR}$	432	0.90	10	0	1.5	1.2	0.952	1.00	504
$V_{RR}$	67	0.90	25	0	1.5	1.2	0.889	1.00	84
V <sub>NW</sub>	2961		•				•	V =	3951
V <sub>W</sub>	990							-	
VR	0.251								
Configu	ration Cha	aracteris	tics						
Minimum ma	aneuver lanes, N	$N_{WL}$		2 lc	Minimum we	eaving lane cl	hanges, LC <sub>MIN</sub>		990 lc/h
Interchange	density, ID			0.8 int/mi	Weaving lan	e changes, L	.C <sub>w</sub>		1392 lc/h
Minimum RI	F lane changes,	$LC_RF$		1 lc/pc	Non-weaving	g lane chang	es, LC <sub>NW</sub>		880 lc/h
Minimum FF	R lane changes,	$LC_FR$		1 lc/pc	Total lane ch	nanges, LC <sub>AL</sub>	L		2272 lc/h
Minimum RI	R lane changes,	$LC_{RR}$		lc/pc	Non-weaving	g vehicle inde	ex, I <sub>NW</sub>		455
Weaving	g Segment	Speed,	Density, I	evel of	Service,	and Cap	acity		
Weaving se	gment flow rate,	V		3951 pc/h	ı -	ensity factor,			0.258
Weaving se	gment capacity,	$c_{w}$		7923 veh/h	1 '	gment speed			48.8 mph
•	gment v/c ratio			0.479	1	aving speed,	**		50.8 mph
_	gment density, [	)	20	0.3 pc/mi/ln	Average non				48.1 mph
Level of Ser	vice, LOS			С	Maximum we	eaving length	ı, L <sub>MAX</sub>		5060 f
Notes									
Chapter 13, "	egments longer the Freeway Merge a That exceed the	ind Diverge Se	gments".	· ·		solated merge	and diverge are	eas using the	procedures of

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Navy Base ICTF

_			REEWAY	/ WEAV			Γ		
General	<b>Informati</b>	on			Site Info	rmation			
Analyst AJR Agency/Company Atkins Date Performed 7/25/2014 Analysis Time Period PM Peak  Project Description Navy Base ICTF				Freeway/Dir of Travel I-26 WB Weaving Segment Location 2200 - Montague to I-526 EB Analysis Year 2038 Build - River Center Site					
Inputs									
Weaving configuration One-Sided Weaving number of lanes, N 4			4 1920ft 60 mph	Freeway minimum speed, S <sub>MIN</sub>			Freewa 1: 230: Leve		
Conver	sions to po	1	li .	l)	11	1			
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	$f_{HV}$	fp	v (pc/h)
$V_{FF}$	4153	0.90	6	0	1.5	1.2	0.971	1.00	4753
$V_{RF}$	1164	0.90	8	0	1.5	1.2	0.962	1.00	1345
$V_{FR}$	351	0.90	9	0	1.5	1.2	0.957	1.00	408
$V_{RR}$	98	0.90	9	0	1.5	1.2	0.957	1.00	114
$V_{NW}$	4867							V =	6620
$V_W$	1753								
VR	0.265								
Configu	ration Cha	aracteris	tics						
Minimum m	aneuver lanes, I	$N_{WL}$		2 lc	Minimum we	eaving lane ch	nanges, LC <sub>MIN</sub>		1753 lc/h
Interchange	e density, ID			0.8 int/mi	Weaving lane changes, LC <sub>w</sub> 215				2155 lc/h
Minimum R	F lane changes,	$LC_RF$		1 lc/pc	Non-weaving lane changes, LC <sub>NW</sub> 12				1273 lc/h
Minimum Fl	R lane changes,	$LC_FR$		1 lc/pc	Total lane changes, LC <sub>ALL</sub> 342i				3428 lc/h
Minimum R	R lane changes,	, LC <sub>RR</sub>		lc/pc	Non-weaving vehicle index, I <sub>NW</sub> 7				748
Weavin	g Segment	t Speed,	Density, I	_evel of	Service,	and Cap	acity		
Weaving segment flow rate, v 6620 pc/h			, ,				0.357		
Weaving segment capacity, c <sub>w</sub> 7953 veh/h						41.4 mph			
Weaving segment v/c ratio 0.808						48.2 mph			
Weaving segment density, D 40.0 pc/mi/ln			Average non-weaving speed, S <sub>NW</sub>			39.4 mph			
				Maximum weaving length, L <sub>MAX</sub> 5209				5209 ft	
Notes			4d			-1-41			
Chapter 13, " b. For volume	egments longer the Freeway Merge a es that exceed the	and Diverge Se e weaving segr	gments".	· ·		solated merge	and diverge are	eas using the	procedures of

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General In	formation	i s/Ailii i	- / (10 10AIII)	IP JUNCTI Site Infor						
Analyst	AJR		E.	reeway/Dir of Tr		I-26 WE	2			
Agency or Comp				nction			B Off to I-	526 WD		
Date Performed	•	is 5/2014		urisdiction		ZZ IU-V	רו 10 ווט ביי	UZU VVD		
Analysis Time P		Peak		nalysis Year		2038 B	uild - Rivor	Center Site		
	on Navy Base IC		Al	ilalysis i cal		2030 B	uliu - IXIVEI	Center Site		
nputs	OII HAVY BASS IS									
Upstream A	ıdi Ramp	Freeway Num	per of Lanes, N	3					Downstre	am Adi
·	_	Ramp Number	of Lanes, N	1					Ramp	
☐Yes	□On	1	ane Length, L <sub>A</sub>						□Yes	On
✓ No	Off	1	ane Length L <sub>D</sub>	830					✓ No	Off
1 -	ft	Freeway Volui		2879					L <sub>down</sub> =	ft
L <sub>up</sub> =	п	Ramp Volume		275					-down	
V,, =	veh/h		Flow Speed, $S_{FF}$	60.0					V <sub>D</sub> =	veh/h
- u		Ramp Free-Fl	ow Speed, S <sub>FR</sub>	25.0						
Conversio	n to pc/h Un	der Base (	Conditions							
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	$f_p$	v = V/PHF	$= x f_{HV} x f_{p}$
Freeway	2879	0.90	Level	14	0	0.	935	1.00	3	423
Ramp	275	0.90	Level	7	0	0.	966	1.00	3	16
JpStream										
DownStream										
- 4: 4:	- £	Merge Areas			<b>5</b> - 4: 4	•		Diverge Areas		
stimation	1 of V <sub>12</sub>				Estimation of v <sub>12</sub>					
	$V_{12} = V_{F}$	(P <sub>FM</sub> )					V <sub>12</sub> =	$V_R + (V_F - V_F)$	P <sub>FD</sub>	
EQ =	(Equa	ation 13-6 or	13-7)		L <sub>EQ</sub> = (Equation 13-12 or 13-13)					
FM =	using	g Equation (E	xhibit 13-6)		P <sub>FD</sub> =		0.	660 using Equ	uation (Exh	ibit 13-7)
' <sub>12</sub> =	pc/h				V <sub>12</sub> =			366 pc/h	,	•
' <sub>3</sub> or V <sub>av34</sub>	•	(Equation 13-	14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>			)57 pc/h (Equ	ation 13 <sub>-</sub> 1	4 or 13 <sub>-</sub> 17
	2,700 pc/h? ☐ Ye		11 01 10 17)			> 2 7		∃Yes ☑ No	20011 10 1	4 01 10 17
	1.5 * V <sub>12</sub> /2							Yes ✓ No		
0 0,01			-16, 13-18, or		"	• .		⊒ Yes 💌 No c/h (Equation	12 16 12	10 or 12
Yes,V <sub>12a</sub> =	13-19	· •	10, 13-10, 01		If Yes,V <sub>12a</sub> =	=		9)	13-10, 13	i-10, 01 13
Capacity C	Checks	,			Capacit	y Ch	ecks	<i></i>		
	Actual	C	apacity	LOS F?			Actual	Ca	pacity	LOS F
					$V_{F}$		3423	Exhibit 13-8	6900	No
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$	-V <sub>R</sub>	3107	Exhibit 13-8	6900	No
					V <sub>R</sub>		316	Exhibit 13-1	1900	No
low Enter	ring Merge lı	nfluence A	rea			terin	g Dive	rge Influen	ce Area	
	Actual		Desirable	Violation?		_	Actual	Max Desirab		Violation
V <sub>R12</sub>		Exhibit 13-8			V <sub>12</sub>	$\neg$	2366	Exhibit 13-8	4400:All	No
	ervice Deteri		f not F)		<del></del>			termination		
								.0086 V <sub>12</sub> - 0.	_	<del>.</del> /
$D_R = 5.475 + 0.00734 \text{ v}_R + 0.0078 \text{ V}_{12} - 0.00627 \text{ L}_A$ $D_R = (\text{pc/mi/ln})$						12	Б			
• •										
` '				LOS = B (Exhibit 13-2)  Speed Determination						
Speed Determination				<del>  '                                   </del>						
				1	-	xhibit 13-				
				S <sub>R</sub> = 49.4 mph (Exhibit 13-12)						
	$S_0$ = mph (Exhibit 13-11)				S <sub>0</sub> = 65.6 mph (Exhibit 13-12)					
<sub>R</sub> = mph (	•				$S_0 = 65$	5.6 mph	(Exhibit	13-12)		
$t_{R} = mph ($ $t_{0} = mph ($	•						(Exhibit (Exhibit	*		

F-4405

General In	formation	i straini s	- 7 ti 12 ti 7 ti 1	IP JUNCTI Site Infor						
Analyst	AJR	1	E.	reeway/Dir of Tr		I-26 WE	Ω			
Agency or Comp				nction				526 WD		
Nate Performed	•	ns 5/2014		urisdiction		ZZ IU-V\	/B Off to I-	UZU VVD		
Analysis Time P		Peak		nalysis Year		2038 B	ıild - River	Center Site		
	on Navy Base IC		Al	ilalysis i cal		2030 Di	aliu - IXIVEI	Center Site		
nputs	on Navy Base to	· 11								
Upstream A	di Ramo	Freeway Num	per of Lanes, N	3					Downstre	am Adi
<u>.</u>	_	Ramp Number	of Lanes, N	1					Ramp	
□Yes	□On	1	ane Length, L <sub>A</sub>						□Yes	On
✓ No	Off	1	ane Length L <sub>D</sub>	830					✓ No	Off
1 -	ft	Freeway Volur		5317					L <sub>down</sub> =	ft
L <sub>up</sub> =	п	Ramp Volume		338					-down	
V,, =	veh/h		Flow Speed, S <sub>FF</sub>	60.0					V <sub>D</sub> =	veh/h
			ow Speed, S <sub>FR</sub>	25.0					_	
conversio	n to pc/h Un	der Base (	Conditions	1		_				
(pc/h)	(Veh/hr)	PHF	Terrain	%Truck	%Rv		f <sub>HV</sub>	$f_p$	v = V/PHF	$x f_{HV} x f_{p}$
Freeway	5317	0.90	Level	11	0	0.0	948	1.00	6	233
Ramp	338	0.90	Level	5	0	0.9	976	1.00	3	85
JpStream										
DownStream								\ . A		
stimation	ofv	Merge Areas			Estimat	ion o		iverge Areas		
.sumation		·- ·			LStillat	1011 0				
$V_{12} = V_F (P_{FM})$				$V_{12} = V_R + (V_F - V_R)P_{FD}$						
L <sub>EQ</sub> = (Equation 13-6 or 13-7)			L <sub>EQ</sub> =		(1	Equation 13-1	2 or 13-13	3)		
) = FM =	using	g Equation (E	xhibit 13-6)		P <sub>FD</sub> =		0.	586 using Equ	uation (Exh	ibit 13-7)
12 =	pc/h				V <sub>12</sub> =		38	315 pc/h		
or V <sub>av34</sub>	pc/h	(Equation 13-	14 or 13-17)		V <sub>3</sub> or V <sub>av34</sub>		24	18 pc/h (Equa	ation 13-1	4 or 13-17
s V <sub>3</sub> or V <sub>av34</sub> >	2,700 pc/h? ☐ Y∈	es 🗌 No			Is V <sub>3</sub> or V <sub>av</sub>	34 > 2,70	00 pc/h? [	]Yes ☑ No		
	1.5 * V <sub>12</sub> /2 Ye				Is V <sub>3</sub> or V <sub>av</sub>	<sub>34</sub> > 1.5	* V <sub>12</sub> /2	Yes <b>☑</b> No		
Yes,V <sub>12a</sub> =			-16, 13-18, or		If Yes,V <sub>12a</sub> =	• .		c/h (Equation	13-16, 13	-18, or 13
	13-19	))			10)					
Capacity C	ì	1 0		1	Capacit	y Che				1.005
	Actual		apacity	LOS F?	V <sub>F</sub>		Actual 6233	Exhibit 13-8	pacity 6900	LOS F
\/		F., b; b; t 40 0			·	\/			-	No
$V_{FO}$		Exhibit 13-8			$V_{FO} = V_{F}$	- v <sub>R</sub>	5848	Exhibit 13-8		No
					V <sub>R</sub>		385	Exhibit 13-1		No
low Enter	ring Merge II			1 10 0	Flow En	_		rge Influen		1 > 0 + 0
\/	Actual		Desirable	Violation?		_	Actual	Max Desirab		Violation
V <sub>R12</sub>		Exhibit 13-8	£ 4 <b>F</b> \		V <sub>12</sub>		815	Exhibit 13-8	4400:All	No No
	ervice Deteri							termination	•	<u>r)                                    </u>
	+ 0.00734 v <sub>R</sub> +	U.0078 V <sub>12</sub> -	0.00627 L <sub>A</sub>		1			.0086 V <sub>12</sub> - 0.0	009 L <sub>D</sub>	
				D <sub>R</sub> = 29.6 (pc/mi/ln)						
,				LOS = D (Exhibit 13-2)						
Speed Determination				Speed Determination						
M <sub>S</sub> = (Exibit 13-11)				1	-	khibit 13-				
				$S_R = 49$	9.3 mph	(Exhibit	13-12)			
<sub>R</sub> = mph (	N ' '									
	Exhibit 13-11)				$S_0 = 60$	).3 mph	(Exhibit	13-12)		
<sub>0</sub> = mph (	Exhibit 13-11) Exhibit 13-13)					-	(Exhibit (Exhibit	-		

F-4406

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		S 526 WB Off to
Agency or Company	Atkins		From/To	EB&WB	
Date Performed	4/25/2014		Jurisdiction	0000 5	"/ D: 0 /
Analysis Time Period	AM Peak		Analysis Year	Site	ıild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	2604	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 14	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D		1- //-	General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments				
fp	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.935	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	3		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performanc	e Measures	<del></del>	Design (N)		
			Design (N)		
Operational (LOS)			Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x I)$	N x f <sub>HV</sub> 1032	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f	
x t <sub>p</sub> )		·	$x f_p$	П۷	pc/h/ln
S	60.0	mph	S P		mph
D = v <sub>p</sub> / S	17.2	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	В		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed			f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens		$E_{R}$ - Exhibits 11-10, 11-12 $E_{T}$ - Exhibits 11-10, 11-11,		
v <sub>p</sub> - Flow rate		e-flow speed	'	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		se free-flow	f <sub>p</sub> - Page 11-18	11 2	TRD - Page 11-1
speed	hour volume		LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-∠,	
DDHV - Directional design	nour volume		1		

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	2215- I- EB&WE	526 WB Off to 3 On
Date Performed	7/25/2014		Jurisdiction		
Analysis Time Period	PM Peak		Analysis Year	2038 Bu Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	☐ Plar	nning Data
Flow Inputs					
Volume, V AADT	4979	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 11	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length	Level mi	
<u> </u>			Up/Down %		
Calculate Flow Adjus	tments				
$f_p$	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.948	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	3		$f_{LC}$		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			,
LOS and Performanc	e Measures	3	Design (N)		
			Design (N)		
Operational (LOS)	NI 6		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x)$ $x f_p$	N X 1 <sub>HV</sub> 1945	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	pc/h/ln
S	57.8	mph	x f <sub>p</sub> )		·
$D = v_p / S$	33.6	pc/mi/ln	S		mph
LOS	D	·	$D = v_p / S$ Required Number of Lanes	e N	pc/mi/ln
Classer			<u> </u>	5, IN	
Glossary	C C	. d	Factor Location		
N - Number of lanes	S - Spee		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
V - Hourly volume	D - Dens	-	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
v <sub>p</sub> - Flow rate LOS - Level of service		e-flow speed ase free-flow	f <sub>p</sub> - Page 11-18		TRD - Page 11-1
speed		IOC IIGG-IIUW	LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2,	
DDHV - Directional design	hour volume		11-3		

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# RAMP ADD OR DROP LANE ANALYSIS (MAINLINE <55 MPH) ATKINS

#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2038 Build-River Center Site AM Peak Navy Base ICTF Freeway/Direction Junction Segment ID I-26 WB On from 526 WB & EB 2218

### Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	1	2	1
Free-Flow Speed, FFS (mph)	55	55	55
Volume, V (veh/h)	2,112	3,508	1,396
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	10%	27%	53%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.95	0.88	0.79
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	2,464	2,212	1,962
Capacity Flow Rate, c (pc/h/ln)	2,200	2,200	2,200
v/c ratio	1.12	1.01	0.89
Density, D <sub>MD</sub> (pc/mi/ln)	43.1	38.7	34.3
LOS	F	F	D

### Formulas and Reference Material

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

HCM 2010, Equation 11-2

$$D_{MD} =$$

HCM 2010, Equation 13-26

## Ramp Roadways Max Service Flow Rates

1 IOW Hales				
	Capacity			
FFS (mi/h)	(pc/h/ln)			
> 50	2,200			
>40-50	2,100			
>30-40	2,000			
≥20-30	1,900			
<20	1,800			

Source: HCM 2010, Exhibit 13-10

#### Diverge LOS Thresholds

Biroigo Eo o Timoonoido				
	Density			
LOS	(pc/mi/ln)			
Α	≤10			
В	>10-20			
С	>20-28			
D	>28-35			
Е	>35			
F	v/c > 1			

Source: HCM 2010, Exhibit 13-2

# RAMP ADD OR DROP LANE ANALYSIS (MAINLINE <55 MPH) ATKINS

#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2038 Build-River Center Site PM Peak Navy Base ICTF Freeway/Direction Junction Segment ID I-26 WB On from 526 WB & EB 2218

### Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	1	2	1
Free-Flow Speed, FFS (mph)	55	55	55
Volume, V (veh/h)	2,442	4,123	1,681
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	7%	20%	37%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.97	0.91	0.84
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	2,808	2,520	2,213
Capacity Flow Rate, c (pc/h/ln)	2,200	2,200	2,200
v/c ratio	1.28	1.15	1.01
Density, D <sub>MD</sub> (pc/mi/ln)	49.1	44.1	38.7
LOS	F	F	F

### Formulas and Reference Material

$$f_{HV} =$$

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

HCM 2010, Equation 11-2

$$D_{MD} =$$

HCM 2010, Equation 13-26

## Ramp Roadways Max Service Flow Rates

1 IOW Hales				
	Capacity			
FFS (mi/h)	(pc/h/ln)			
> 50	2,200			
>40-50	2,100			
>30-40	2,000			
≥20-30	1,900			
<20	1,800			

Source: HCM 2010, Exhibit 13-10

#### Diverge LOS Thresholds

	Density
LOS	(pc/mi/ln)
Α	≤10
В	>10-20
С	>20-28
D	>28-35
Е	>35
F	v/c > 1

Source: HCM 2010, Exhibit 13-2

Navy Base ICTF

			REEWAY	/ WEAV	NG WOF	RKSHEE	T		
General Information			Site Information						
Analyst AJR Agency/Company Atkins Date Performed 7/25/2014 Analysis Time Period AM Peak  Project Description Navy Base ICTF			Freeway/Dir of Travel I-26 WB Weaving Segment Location 2220 - 526 to Rem/Aviation C-D Analysis Year 2038 Build - River Center Site						
Inputs									
Weaving configuration  Weaving number of lanes, N  Weaving segment length, L <sub>S</sub> Freeway free-flow speed, FFS  One-Sided  5  2285ft  60 mph			Erooway maximum canacity C			Freeway 15 2300 Leve			
Convers	sions to po	c/h Unde	r Base Co	ndition	li .	1		,	
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	$f_{HV}$	fp	v (pc/h)
$V_{FF}$	1988	0.90	14	0	1.5	1.2	0.935	1.00	2364
$V_{RF}$	2679	0.90	27	0	1.5	1.2	0.881	1.00	3379
$V_{FR}$	616	0.90	14	0	1.5	1.2	0.935	1.00	732
$V_{RR}$	829	0.90	27	0	1.5	1.2	0.881	1.00	1045
$V_{NW}$	3409			-	-	-		V =	7520
$V_W$	4111								
VR	0.547								
Configu	ration Cha	aracterist	tics						
Minimum m	aneuver lanes,	N <sub>WL</sub>		3 lc	Minimum we	eaving lane cl	hanges, LC <sub>MIN</sub>		lc/h
Interchange	e density, ID			0.7 int/mi	Weaving lan	e changes, L	.C <sub>w</sub>		lc/h
Minimum R	F lane changes,	, LC <sub>RF</sub>		0 lc/pc	Non-weaving lane changes, LC <sub>NW</sub>			lc/h	
Minimum FI	R lane changes,	, LC <sub>FR</sub>		1 lc/pc	Total lane changes, LC <sub>ALL</sub>			lc/h	
Minimum R	R lane changes	, LC <sub>RR</sub>		lc/pc	Non-weaving vehicle index, I <sub>NW</sub>			353	
Weaving	g Segmen	t Speed,	Density, I	_evel of	Service,	and Cap	pacity		
Weaving se	gment flow rate	, V		7520 pc/h	Weaving inte	ensity factor,	W		
Weaving segment capacity, c <sub>w</sub> 5983 veh/h			Weaving segment speed, S			mph			
Weaving segment v/c ratio 1.175			Average weaving speed, $S_{\rm W}$			mph			
Weaving segment density, D pc/mi/ln			Average non-weaving speed, S <sub>NW</sub>			mph			
Level of Sei	rvice, LOS			F	Maximum we	eaving length	n, L <sub>MAX</sub>		6811 ft
Notes									
Chapter 13, "	egments longer to Freeway Merge a es that exceed the	and Diverge Se	gments".			solated merge	and diverge ar	eas using the	procedures of

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Navy Base ICTF

			REEWA	/ WEAV			T		
Genera	I Information	on			Site Info	rmation			
Analyst AJR Agency/Company Atkins Date Performed 7/25/2014 Analysis Time Period PM Peak  Project Description Navy Base ICTF			Freeway/Dir of Travel I-26 WB Weaving Segment Location 2220 - 526 to Rem/Aviation C- Analysis Year 2038 Build - River Center Site						
Inputs	, ,								
Weaving number of lanes, N Weaving segment length, L <sub>s</sub> 2285		2285ft 60 mph	Freeway minimum speed, S <sub>MIN</sub>				Freewa 1 230 Leve		
Conver	sions to po	1	T T	T .	11"	I _			
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	f <sub>HV</sub>	fp	v (pc/h)
$V_{FF}$	4376	0.90	11	0	1.5	1.2	0.948	1.00	5130
$V_{RF}$	3624	0.90	20	0	1.5	1.2	0.909	1.00	4429
$V_{FR}$	603	0.90	11	0	1.5	1.2	0.948	1.00	707
$V_RR$	499	0.90	20	0	1.5	1.2	0.909	1.00	610
$V_{NW}$	5740							V =	10876
$V_{W}$	5136								
VR	0.472								
Config	uration Cha	aracteris	tics						
Minimum maneuver lanes, N <sub>WL</sub> 3 Ic			Minimum we	eaving lane cl	hanges, LC <sub>MIN</sub>		lc/h		
Interchang	e density, ID			0.7 int/mi	Weaving lan	ie changes, L	.C <sub>w</sub>		lc/h
Minimum F	RF lane changes,	$LC_RF$		0 lc/pc	Non-weaving	g lane chang	es, LC <sub>NW</sub>		lc/h
Minimum F	R lane changes,	$LC_FR$		1 lc/pc	Total lane changes, LC <sub>ALL</sub>			lc/h	
Minimum F	RR lane changes,	, LC <sub>RR</sub>		lc/pc	Non-weaving vehicle index, I <sub>NW</sub>				
Weavin	g Segment	t Speed,	Density, l	Level of	Service,	and Cap	acity		
Weaving s	Veaving segment flow rate, v 10876 pc/h Veaving segment capacity, c <sub>w</sub> 7025 veh/h Veaving segment v/c ratio 1.467		Weaving intensity factor, W Weaving segment speed, S Average weaving speed, S <sub>w</sub>			mph mph			
Weaving segment density, D pc/mi/ln			I. ". a			mph			
Level of Service, LOS F						5938 f			
Notes							INICAX		
a. Weaving Chapter 13,	segments longer the "Freeway Merge anes that exceed the	and Diverge Se	gments".			solated merge	and diverge ar	eas using the	procedures of

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave	I <i>I-</i> 26 WE	3
Agency or Company	Atkins		From/To	2225- R CD On	Rem/Avia CD Off to
Date Performed	7/25/2014		Jurisdiction	CD OII	
Analysis Time Period	AM Peak		Analysis Year	2038 Bu Site	uild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Pes.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	4667	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 16	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P <sub>R</sub> General Terrain: Grade % Length	0 Level mi	
			Up/Down %		
Calculate Flow Adjus	tments				
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] 0.926	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	4		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	•
Base free-flow Speed, BFFS		mph		00.0	mph
LOS and Performanc	e Measures	3	Design (N)		
Operational (LOS) v <sub>p</sub> = (V or DDHV) / (PHF x	N x f		Design (N) Design LOS		
x f <sub>p</sub> )	<sup>⊓∨</sup> 1400	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	pc/h/ln
S P'	60.0	mph	x f <sub>p</sub> )		<b>P</b> 3
$D = v_p / S$	23.3	pc/mi/ln	S		mph
LOS	C	po///////	$D = v_p / S$ Required Number of Lanes	s N	pc/mi/ln
Glossary			Factor Location		
N - Number of lanes	S - Spee	74 			
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>p</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18 LOS, S, FFS, v <sub>p</sub> - Exhibits	11-2	TRD - Page 11-11
speed DDHV - Directional design	hour volume		11-3		
					<del></del>

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	2225- R CD On	em/Avia CD Off to
Date Performed	7/25/2014		Jurisdiction	OD OII	
Analysis Time Period	PM Peak		Analysis Year	2038 Bu Site	ıild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			es.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	8000	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 13	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length	Level mi	
			Up/Down %		
Calculate Flow Adjus	tments				
$f_p$	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.939	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	$f_{LW}$		mph
Number of Lanes, N	4		$f_{LC}$		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			r
LOS and Performanc	e Measures	3	Design (N)		
			Design (N)		
Operational (LOS)	NI £		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x)$	N X T <sub>HV</sub> 2367	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	N x f <sub>HV</sub>	
x f <sub>p</sub> )	40.0		$x f_p$ )		pc/h/ln
S D = · · · / C	49.3	mph	s		mph
$D = v_p / S$	48.0	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	F		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed			f
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		f <sub>LW</sub> - Exhibit 11-8
v <sub>p</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		se free-flow	f <sub>p</sub> - Page 11-18	11.0	TRD - Page 11-1
speed			LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-∠,	
DDHV - Directional design	nour volume		11-0		

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# RAMP ADD OR DROP LANE ANALYSIS (MAINLINE <55 MPH) ATKINS

### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2038 Build-River Center Site AM Peak Navy Base ICTF Freeway/Direction Junction Segment ID I-26 WB C-D WB Off to Remount 2230

### Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	2	1	1
Free-Flow Speed, FFS (mph)	55	55	45
Volume, V (veh/h)	1,445	839	606
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, $P_T$	5%	4%	5%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, f <sub>HV</sub>	0.98	0.98	0.98
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	823	951	690
Capacity Flow Rate, c (pc/h/ln)	2,200	2,200	2,100
v/c ratio	0.37	0.43	0.33
Density, D <sub>MD</sub> (pc/mi/ln)	14.4	16.6	12.1
LOS	В	В	В

### Formulas and Reference Material

$$f_{HV} =$$

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

HCM 2010, Equation 11-2

$$D_{MD} =$$

HCM 2010, Equation 13-26

## Ramp Roadways Max Service Flow Rates

1 low hates			
	Capacity		
FFS (mi/h)	(pc/h/ln)		
> 50	2,200		
>40-50	2,100		
>30-40	2,000		
≥20-30	1,900		
<20	1,800		

Source: HCM 2010, Exhibit 13-10

#### Diverge LOS Thresholds

- 3	
	Density
LOS	(pc/mi/ln)
Α	≤10
В	>10-20
С	>20-28
D	>28-35
Е	>35
F	v/c > 1

Source: HCM 2010, Exhibit 13-2

### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2038 Build-River Center Site PM Peak Navy Base ICTF Freeway/Direction Junction Segment ID I-26 WB C-D WB Off to Remount 2230

### Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	2	1	1
Free-Flow Speed, FFS (mph)	55	55	45
Volume, V (veh/h)	1,102	547	555
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	5%	5%	5%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.98	0.98	0.98
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	628	623	632
Capacity Flow Rate, c (pc/h/ln)	2,200	2,200	2,100
v/c ratio	0.29	0.28	0.30
Density, D <sub>MD</sub> (pc/mi/ln)	11.0	10.9	11.1
LOS	В	В	В

### Formulas and Reference Material

$$f_{HV} =$$

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

HCM 2010, Equation 11-2

$$D_{MD} =$$

HCM 2010, Equation 13-26

## Ramp Roadways Max Service Flow Rates

1 IOW Hales					
	Capacity				
FFS (mi/h)	(pc/h/ln)				
> 50	2,200				
>40-50	2,100				
>30-40	2,000				
≥20-30	1,900				
<20	1,800				

Source: HCM 2010, Exhibit 13-10

#### Diverge LOS Thresholds

- 3	
	Density
LOS	(pc/mi/ln)
Α	≤10
В	>10-20
С	>20-28
D	>28-35
Е	>35
F	v/c > 1

	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst Agency or Company Date Performed Analysis Time Period	AJR Atkins 7/25/2014 AM Peak		Highway/Direction of Trave From/To Jurisdiction Analysis Year	2235-Re Remoui	emount Off to
Project Description Navy	Base ICTF			0.10	
✓ Oper.(LOS)			Des.(N)	□Plar	nning Data
Flow Inputs					
Volume, V AADT Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D	1678	veh/h veh/day veh/h	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub> %RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0.90 4 0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub> E <sub>T</sub>	1.00 1.5		$E_R$ $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1.2 1)] 0.980	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft	<u> </u>		
Rt-Side Lat. Clearance		ft	f <sub>LW</sub>		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured) Base free-flow Speed, BFFS	55.0	mph mph	FFS	55.0	mph
LOS and Performanc	e Measures	 S	Design (N)		
Operational (LOS)  v <sub>p</sub> = (V or DDHV) / (PHF x l x f <sub>p</sub> ) S D = v <sub>p</sub> / S LOS	N x f <sub>HV</sub> 951 55.0 17.3 B	pc/h/ln mph pc/mi/ln	Design (N) Design LOS $v_p = (V \text{ or DDHV}) / (PHF \text{ x} \text{ x } f_p)$ S $D = v_p / S$ Required Number of Lanes		pc/h/ln mph pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed DDHV - Directional design	BFFS - Ba		$E_R$ - Exhibits 11-10, 11-12 $E_T$ - Exhibits 11-10, 11-11, $f_p$ - Page 11-18 LOS, S, FFS, $v_p$ - Exhibits 11-3	11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	T	
General Information			Site Information		
Analyst Agency or Company Date Performed Analysis Time Period	AJR Atkins 7/25/2014 PM Peak		Highway/Direction of Trave From/To Jurisdiction Analysis Year	2235-Re Remoul	emount Off to
Project Description Navy	Base ICTF			One	
✓ Oper.(LOS)			Des.(N)	Pla	nning Data
Flow Inputs					
Volume, V AADT Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D	1094	veh/h veh/day veh/h	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub> %RVs, P <sub>R</sub> General Terrain: Grade % Length Up/Down %	0.90 5 0 Level mi	
Calculate Flow Adjus	tments				
f <sub>p</sub> E <sub>T</sub>	1.00 1.5		$E_R$ $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	1.2 1)] 0.976	
Speed Inputs			Calc Speed Adj and		
Lane Width		ft			
Rt-Side Lat. Clearance Number of Lanes, N	2	ft	f <sub>LW</sub>		mph
Total Ramp Density, TRD FFS (measured)	55.0	ramps/mi mph	f <sub>LC</sub> TRD Adjustment		mph mph
Base free-flow Speed, BFFS	00.0	mph	FFS	55.0	mph
LOS and Performanc	e Measures	6	Design (N)		
Operational (LOS) v <sub>p</sub> = (V or DDHV) / (PHF x I x f <sub>p</sub> ) S	N x f <sub>HV</sub> 623 55.0	pc/h/ln mph	$\frac{\text{Design (N)}}{\text{Design LOS}}$ $v_p = (V \text{ or DDHV}) / (PHF x)$ $x f_p)$	N x f <sub>HV</sub>	pc/h/ln
D = v <sub>p</sub> / S LOS	11.3 B	pc/mi/ln	S $D = v_p / S$ Required Number of Lane:	s N	mph pc/mi/ln
Glossary			Factor Location	<u> </u>	
N - Number of lanes V - Hourly volume v <sub>p</sub> - Flow rate LOS - Level of service speed DDHV - Directional design	BFFS - Ba		$E_R$ - Exhibits 11-10, 11-12 $E_T$ - Exhibits 11-10, 11-11, $f_p$ - Page 11-18 LOS, S, FFS, $v_p$ - Exhibits 11-3	11-13	f <sub>LW</sub> - Exhibit 11-8 f <sub>LC</sub> - Exhibit 11-9 TRD - Page 11-1

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Navy Base ICTF

			REEWA	VVEAV			I		
Genera	I Information	on			Site Info	rmation			
Analyst Agency/Col Date Perfor Analysis Til	rmed me Period	AJR Atkins 7/25/20 AM Pe			Freeway/Dir Weaving Seg Analysis Yea	gment Location	on 2240 -	VB C-D - Remount to Build - River	
Project Des Inputs	scription Navy Ba	ase ICTF							
Weaving co Weaving no Weaving se Freeway fre	umber of lanes, Negment length, Lee-flow speed, Fl	S FS		33 mpn	Freeway min Freeway max Terrain type	imum speed,	$S_{MIN}$ ity, $C_{IFL}$		C-D Roadway Multilan Highway 1: 225 Leve
Conver	sions to po	1	II.	II .	ı .				1
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	f <sub>HV</sub>	fp	v (pc/h)
V <sub>FF</sub>	0	0.90	0	0	1.5	1.2	1.000	1.00	0
$V_{RF}$	261	0.90	18	0	1.5	1.2	0.917	1.00	316
$V_{FR}$	839	0.90	4	0	1.5	1.2	0.980	1.00	951
$V_{RR}$	0	0.90	0	0	1.5	1.2	1.000	1.00	0
$V_{NW}$	0							V =	1267
$V_{W}$	1267								
VR	1.000								
Configu	uration Cha	aracteris	tics		•				
Minimum n	naneuver lanes, l	$N_{WL}$		2 lc	Minimum we	aving lane cl	nanges, LC <sub>MIN</sub>		1267 lc/h
_	e density, ID			0.8 int/mi	Weaving lan	e changes, L	$C_W$		1320 lc/h
Minimum F	RF lane changes,	$LC_{RF}$		1 lc/pc	Non-weaving lane changes, LC <sub>NW</sub>			21 lc/h	
Minimum F	R lane changes,	$LC_{FR}$		1 lc/pc	Total lane changes, LC <sub>ALL</sub>			1341 lc/h	
Minimum F	RR lane changes,	, LC <sub>RR</sub>		lc/pc	Non-weaving	g vehicle inde	ex, I <sub>NW</sub>		C
Weavin	g Segment	t Speed,	Density, l	_evel of	Service,	and Cap	acity		
Weaving segment flow rate, v 1267 pc/h						0.357			
Weaving segment capacity, c <sub>w</sub> 2400 veh/h						44.5 mph			
Weaving segment v/c ratio 0.528						44.5 mph			
	egment density, I	·			1111		42.8 mph		
	ervice, LOS			В	Maximum we	eaving length	, L <sub>MAX</sub>		14232 f
Chapter 13,	segments longer the "Freeway Merge and the that exceed the	and Diverge Se	egments".			solated merge	and diverge are	eas using the	procedures of

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Navy Base ICTF

Conorel	Informati		REEWAY	VVEAV			I		
General	Informati	on			Site Info	rmation			
Analyst Agency/Com Date Perforr Analysis Tim	ned	AJR Atkins 7/25/20 PM Pea			Freeway/Dir Weaving Seg Analysis Yea	gment Location	on 2240 -	/B C-D - Remount to Build - River	
	cription Navy B	ase ICTF							
Inputs					1				
_	nfiguration mber of lanes, N gment length, L			One-Sided 2 750ft	Segment typ				C-D Roadwa Multilar Highwa
	e-flow speed, F	0		55 mph	Freeway min				
,	,			,	Freeway max Terrain type	ximum capac	ity, C <sub>IFL</sub>		225 Lev
Convers	sions to po	c/h Unde	r Base Co	ndition					LCV
	V (veh/h)	PHF	Truck (%)	RV (%)	E <sub>T</sub>	E <sub>R</sub>	$f_{HV}$	fp	v (pc/h)
V <sub>FF</sub>	0	0.90	0	0	1.5	1.2	1.000	1.00	0
$V_{RF}$	951	0.90	4	0	1.5	1.2	0.980	1.00	1078
V <sub>FR</sub>	547	0.90	5	0	1.5	1.2	0.976	1.00	623
V <sub>RR</sub>	0	0.90	0	0	1.5	1.2	1.000	1.00	0
V <sub>NW</sub>	0		•	•	•		•	V =	1701
V <sub>W</sub>	1701								
√R	1.000								
Configu	ration Cha	aracteris	tics						
Minimum ma	aneuver lanes,	N <sub>WL</sub>		2 lc	Minimum we	aving lane cl	nanges, LC <sub>MIN</sub>		1701 lc/
Interchange	density, ID			0.8 int/mi	Weaving lan	e changes, L	$C_{W}$		1754 lc
Minimum Ri	F lane changes,	, LC <sub>RF</sub>		1 lc/pc	Non-weaving lane changes, LC <sub>NW</sub>				21 lc/
Minimum FF	R lane changes,	, LC <sub>FR</sub>		1 lc/pc	Total lane changes, LC <sub>ALL</sub>				1775 lc/
Minimum RI	R lane changes	, LC <sub>RR</sub>		lc/pc	Non-weaving	g vehicle inde	ex, I <sub>NW</sub>		
Weaving	g Segmen	t Speed,	Density, I	_evel of	Service,	and Cap	acity		
Weaving se	gment flow rate	, V		1701 pc/h	1 *	ensity factor,			0.44
Weaving se	gment capacity	/, c <sub>w</sub> 2400 veh/h			Weaving segment speed, S				42.7 mp
•	gment v/c ratio			0.709	1	aving speed,	••		42.7 mp
•	gment density,	D				38.7 mp			
Level of Ser	vice, LOS			В	Maximum we	eaving length	ı, L <sub>MAX</sub>		14232
Notes									
Chapter 13, "	egments longer t Freeway Merge a es that exceed the	and Diverge Se	gments".	-		solated merge	and diverge are	eas using the	procedures of

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	2245 - A On	Avia Off to Avia EB
Date Performed	7/25/2014		Jurisdiction	On	
Analysis Time Period	AM Peak		Analysis Year	2038 Bu Site	ıild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	522	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 18	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments		·		
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] <i>0.917</i>	
Speed Inputs			Calc Speed Adj and		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f <sub>LW</sub>		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	55.0	mph		55.0	•
Base free-flow Speed,	00.0	•	FFS	55.0	mph
BFFS		mph			
LOS and Performanc	e Measures	8	Design (N)		
Operational (LOS)			Design (N)		
	N v f		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x   v_f)$	1N X 1 <sub>HV</sub> 316	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	$N \times f_{HV}$	no/h/ln
x f <sub>p</sub> )	55.0	mnh	$x f_p$ )		pc/h/ln
S D = v / S		mph	S		mph
D = v <sub>p</sub> / S LOS	5.7	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LU3	Α		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spe	ed	F - Fyhihite 11 10 11 12		f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens		$E_{R}$ - Exhibits 11-10, 11-12 $E_{T}$ - Exhibits 11-10, 11-11,		
v <sub>p</sub> - Flow rate		e-flow speed	1 '	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		ase free-flow	f <sub>p</sub> - Page 11-18	11 2	TRD - Page 11-11
speed	haur valeess		LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	ı ı-∠,	
DDHV - Directional design	nour volume				

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	BASIC FR	EEWAY SE	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst	AJR		Highway/Direction of Trave		
Agency or Company	Atkins		From/To	2245 - A On	Avia Off to Avia EB
Date Performed	7/25/2014		Jurisdiction	On	
Analysis Time Period	PM Peak		Analysis Year	2038 Bu Site	ıild - River Center
Project Description Navy	Base ICTF				
✓ Oper.(LOS)			Des.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT	1902	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P <sub>T</sub>	0.90 4	
Peak-Hr Prop. of AADT, K			%RVs, P <sub>R</sub>	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	
Calculate Flow Adjus	tments				
f <sub>p</sub>	1.00		E <sub>R</sub>	1.2	
E <sub>T</sub>	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	)] <i>0.980</i>	
Speed Inputs			Calc Speed Adj and	FFS	
Lane Width		ft	<u> </u>		
Rt-Side Lat. Clearance		ft	f <sub>LW</sub>		mph
Number of Lanes, N	2		f <sub>LC</sub>		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	55.0	mph		<i>EE</i> 0	•
Base free-flow Speed,		•	FFS	55.0	mph
BFFS		mph			
LOS and Performanc	e Measures	<u> </u>	Design (N)		
Operational (LOS)			Design (N)		
Operational (LOS)	N v f		Design LOS		
$v_p = (V \text{ or DDHV}) / (PHF x   v_f)$	1N A 1 <sub>HV</sub> 1078	pc/h/ln	$v_p = (V \text{ or DDHV}) / (PHF x)$	$N \times f_{HV}$	no/h/ln
x f <sub>p</sub> )	55.0	mnh	$x f_p$ )		pc/h/ln
S D = v / S		mph	S		mph
D = v <sub>p</sub> / S LOS	19.6 C	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LU3	C		Required Number of Lanes	s, N	
Glossary			Factor Location		
N - Number of lanes	S - Spee	ed	F - Evhibite 11 10 11 12		f <sub>I W</sub> - Exhibit 11-8
V - Hourly volume	D - Dens		E <sub>R</sub> - Exhibits 11-10, 11-12		
v <sub>p</sub> - Flow rate		e-flow speed	E <sub>T</sub> - Exhibits 11-10, 11-11,	11-13	f <sub>LC</sub> - Exhibit 11-9
LOS - Level of service		se free-flow	f <sub>p</sub> - Page 11-18	11 2	TRD - Page 11-11
speed	haur valores		LOS, S, FFS, v <sub>p</sub> - Exhibits 11-3	11-∠,	
DDHV - Directional design	nour volume				

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#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2038 Build-River Center Site AM Peak Navy Base ICTF Freeway/Direction Junction Segment ID

I-26 WB C-D WB On from Aviation EB 2250

### Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	1	1	1
Free-Flow Speed, FFS (mph)	55	55	25
Volume, V (veh/h)	261	281	20
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	18%	19%	25%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.92	0.91	0.89
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	316	342	25
Capacity Flow Rate, c (pc/h/ln)	2,200	2,200	1,900
v/c ratio	0.14	0.16	0.01
Density, D <sub>MD</sub> (pc/mi/ln)	5.5	6.0	0.4
LOS	Α	A	Α

### Formulas and Reference Material

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

HCM 2010, Equation 11-2

$$D_{MD} =$$

HCM 2010, Equation 13-26

## Ramp Roadways Max Service Flow Rates

riow Rates		
	Capacity	
FFS (mi/h)	(pc/h/ln)	
> 50	2,200	
>40-50	2,100	
>30-40	2,000	
≥20-30	1,900	
<20	1,800	

Source: HCM 2010, Exhibit 13-10

#### Diverge LOS Thresholds

21101g0 20	
	Density
LOS	(pc/mi/ln)
Α	≤10
В	>10-20
С	>20-28
D	>28-35
Е	>35
F	v/c > 1

#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2038 Build-River Center Site PM Peak Navy Base ICTF Freeway/Direction Junction Segment ID

I-26 WB C-D WB On from Aviation EB 2250

### Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	1	1	1
Free-Flow Speed, FFS (mph)	55	55	25
Volume, V (veh/h)	951	1,335	384
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	4%	3%	2%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.98	0.99	0.99
Demand Flow Rate, $v_p$ (pc/h/ln)	1,078	1,506	431
Capacity Flow Rate, c (pc/h/ln)	2,200	2,200	1,900
v/c ratio	0.49	0.68	0.23
Density, D <sub>MD</sub> (pc/mi/ln)	18.9	26.4	7.5
LOS	В	C	А

### Formulas and Reference Material

$$f_{HV} = \frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

$$V_{p} = \frac{V}{PHF^*N^*f_{HV}^*f_{P}}$$

HCM 2010, Equation 11-2

$$D_{MD} = \frac{0.0175^*v_f}{N}$$

HCM 2010, Equation 13-26

#### Ramp Roadways Max Service Flow Rates

	Capacity
FFS (mi/h)	(pc/h/ln)
> 50	2,200
>40-50	2,100
>30-40	2,000
≥20-30	1,900
<20	1,800

Source: HCM 2010, Exhibit 13-10

#### Diverge LOS Thresholds

2110190 20	0 111100110100
	Density
LOS	(pc/mi/ln)
Α	≤10
В	>10-20
С	>20-28
D	>28-35
Е	>35
F	v/c > 1

#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2038 Build-River Center Site AM Peak Navy Base ICTF Freeway/Direction Junction Segment ID

I-26 WB C-D WB On from Aviation WB 2260

### Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	1	1	1
Free-Flow Speed, FFS (mph)	55	55	45
Volume, V (veh/h)	281	379	98
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	19%	21%	27%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.91	0.90	0.88
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	342	465	124
Capacity Flow Rate, c (pc/h/ln)	2,200	2,200	2,100
v/c ratio	0.16	0.21	0.06
Density, D <sub>MD</sub> (pc/mi/ln)	6.0	8.1	2.2
LOS	Α	Α	А

### Formulas and Reference Material

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

HCM 2010, Equation 11-2

$$D_{MD} =$$

HCM 2010, Equation 13-26

## Ramp Roadways Max Service Flow Rates

1 IOW Hales		
	Capacity	
FFS (mi/h)	(pc/h/ln)	
> 50	2,200	
>40-50	2,100	
>30-40	2,000	
≥20-30	1,900	
<20	1,800	

Source: HCM 2010, Exhibit 13-10

#### Diverge LOS Thresholds

21101g0 20	
	Density
LOS	(pc/mi/ln)
Α	≤10
В	>10-20
С	>20-28
D	>28-35
Е	>35
F	v/c > 1

#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description: 7/25/2014 2038 Build-River Center Site PM Peak Navy Base ICTF Freeway/Direction Junction Segment ID

I-26 WB C-D WB On from Aviation WB 2260

### Inputs

	Mainline Upstream Ramp	Mainline Downstream Ramp	Ramp
Number of Lanes, N	1	1	1
Free-Flow Speed, FFS (mph)	55	55	45
Volume, V (veh/h)	1,335	1,834	499
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, $P_T$	3%	4%	4%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Upstream of Off-Ramp	Downstream of Off-Ramp	Off-Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.99	0.98	0.98
Demand Flow Rate, $v_p$ (pc/h/ln)	1,506	2,079	566
Capacity Flow Rate, c (pc/h/ln)	2,200	2,200	2,100
v/c ratio	0.68	0.95	0.27
Density, D <sub>MD</sub> (pc/mi/ln)	26.4	36.4	9.9
LOS	С	E	Α

### Formulas and Reference Material

$$f_{HV} = \frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)} \qquad \text{HCM 2010, Equation 11-3}$$
 
$$V_p = \frac{V}{PHF^*N^*f_{HV}^*f_{P}} \qquad \text{HCM 2010, Equation 11-2}$$
 
$$D_{MD} = \frac{0.0175^*v_f}{N} \qquad \text{HCM 2010, Equation 13-26}$$

Ramp Roadways Max Service
Flow Rates

1 IOW Hales	
	Capacity
FFS (mi/h)	(pc/h/ln)
> 50	2,200
>40-50	2,100
>30-40	2,000
≥20-30	1,900
<20	1,800

Source: HCM 2010, Exhibit 13-10

#### Diverge LOS Thresholds

Bivoigo Ec	70 111100110100
	Density
LOS	(pc/mi/ln)
Α	≤10
В	>10-20
С	>20-28
D	>28-35
Е	>35
F	v/c > 1

# FREEWAY RAMP ADD OR DROP LANE ANALYSIS ATKINS

#### **General Information**

Date Performed: Analysis Year Analysis Time Period: 7/25/2014 2038 Build-River Center Site AM Peak

Junction Segment ID

Freeway/Direction

I-26 WB From Rem/Aviation C-D 2270

Project Description: Navy Base ICTF

### Inputs

	Freeway Upstream of Off-Ramp	Freeway Downstream of Off-Ramp	Off-Ramp
Number of Lanes, N	4	5	1
Free-Flow Speed, FFS (mph)	60	60	55
Volume, V (veh/h)	4,667	5,046	379
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, P <sub>T</sub>	16%	16%	21%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Freeway Upstream Ramp	Freeway Downstream Ramp	Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.93	0.93	0.90
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	1,400	1,211	465
Capacity Flow Rate, c (pc/h/ln)	2,300	2,300	2,200
v/c ratio	0.61	0.53	0.21
Density, D <sub>MD</sub> (pc/mi/ln)	24.5	21.2	8.1
LOS	С	С	Α

### Formulas and Reference Material

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

٧ \_

HCM 2010, Equation 11-2

 $D_{MD} =$ 

HCM 2010, Equation 13-26

Basic Freeway Segments Max Service Flow Rates

	Capacity
FFS (mi/h)	(pc/h/ln)
75	2,400
70	2,400
65	2,350
60	2,300
55	2,250

Source: HCM 2010, Exhibit 11-17

Ramp Roadways Max Service Flow Rates

	Capacity
FFS (mi/h)	(pc/h/ln)
> 50	2,200
>40-50	2,100
>30-40	2,000
≥20-30	1,900
<20	1,800

Diverge LOS Thresholds

	Density
LOS	(pc/mi/ln)
Α	≤10
В	>10-20
С	>20-28
D	>28-35
E	>35
F	v/c > 1

Source: HCM 2010, Exhibit 13-10

## FREEWAY RAMP ADD OR DROP LANE ANALYSIS **ATKINS**

#### **General Information**

Date Performed: Analysis Year Analysis Time Period: Project Description:

7/25/2014 2038 Build-River Center Site PM Peak Navy Base ICTF

Freeway/Direction Junction Segment ID

I-26 WB From Rem/Aviation C-D 2270

Inputs

	Freeway Upstream of Ramp	Freeway Downstream of Ramp	Ramp
Number of Lanes, N	4	5	1
Free-Flow Speed, FFS (mph)	60	60	55
Volume, V (veh/h)	8,000	9,834	1,834
Driver Population, f <sub>P</sub>	1	1	1
General Terrain	Level	Level	Level
Peak Hour Factor, PHF	0.90	0.90	0.90
%Trucks and Buses, $P_T$	13%	12%	4%
%RVs, P <sub>R</sub>	0%	0%	0%

#### Performance Measures

	Freeway Upstream Ramp	Freeway Downstream Ramp	Ramp
Heavy Vehicle Adjustment Factor, $f_{HV}$	0.94	0.94	0.98
Demand Flow Rate, v <sub>p</sub> (pc/h/ln)	2,367	2,316	2,079
Capacity Flow Rate, c (pc/h/ln)	2,300	2,300	2,200
v/c ratio	1.03	1.01	0.95
Density, D <sub>MD</sub> (pc/mi/ln)	41.4	40.5	36.4
LOS	F	F	Е

### Formulas and Reference Material

$$\frac{1}{1 + P_T(E_{T}-1) + P_R(E_{R}-1)}$$

HCM 2010, Equation 11-3

HCM 2010, Equation 11-2

 $D_{MD} =$ 

HCM 2010, Equation 13-26

**Basic Freeway Segments** Max Service Flow Rates

	Capacity
FFS (mi/h)	(pc/h/ln)
75	2,400
70	2,400
65	2,350
60	2,300
55	2,250

Source: HCM 2010, Exhibit 11-17

	Capacity
FFS (mi/h)	(pc/h/ln)
> 50	2,200
>40-50	2,100
>30-40	2,000
≥20-30	1,900
<20	1,800

Ramp Roadways Max

Service Flow Rates

Source: HCM 2010, Exhibit 13-10

Diverge LOS Thresholds

	Density
LOS	(pc/mi/ln)
Α	≤10
В	>10-20
С	>20-28
D	>28-35
E	>35
F	v/c > 1